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THE

BRITISH MOSS-FLORA.

BY

R. BRAITHWAITE, M.D., F.L.S., &c.

SOCIO CORRISP. DELLA SOCIETÀ CRITTOGAM. ITALIANA.

VOL. I.

ACROCARPOUS MOSSES.

"The means therefore which unto us are lent,
Him to behold, is on His workes to looke,
Which He hath made in beautie excellent:
And in the same, as in a brazen booke,
To read enregister'd in every nooke
His goodnesse."

Spenser.

London:

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THE

BRITISH MOSS-FLORA.

VOL. I.

ACROCARPI I.

ANDREÆACEÆ, BUXBAUMIACEÆ, GEORGIACEÆ,
POLYTRICHACEÆ, FISSIDENTACEÆ, LEUCOBRYACEÆ,
DICRANACEÆ, TORTULACEÆ, WEBERACEÆ.

BY

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TO THE MEMORY

OF THE LATE WILLIAM WILSON,

OF WARRINGTON,

THE GREATEST OF BRITISH BRYOLOGISTS,

THIS WORK IS AFFECTIONATELY

INSCRIBED.

R. BRAITHWAITE.

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PREFACE.

THE great want of a guide to our recently much-extended Moss-Flora, and the solicitation of numerous friends, have induced the Author to commence a work which he trusts will meet the requirements of all who study these interesting plants.

The cell structure of the leaves, so important in the distinction of genera and species, will receive due attention both in the figures and descriptions, and the bibliography, while not attempting to be exhaustive, will be ampler than has hitherto appeared in any British work; the records of localities for all but common species will also be numerous, the mark ! after any of these indicates that the specimen has been examined, and !! that it is also in the Author's herbarium.

In the nomenclature, the oldest published name has been adopted when there were no sound reasons to the contrary, and it is greatly to be deplored that so little attention has been paid to the laws drawn up for our guidance, for an author is not at liberty to change a specific name on transferring it to a new genus, nor to supersede by a new name, one previously published, even by himself.

The term *peristome* is restricted to the outer or parietal series of appendages, when this organ is double, the inner, proceeding from the spore-sac, being distinguished as the *endostome*, and the adjective termination to specific names in honour of individuals is also altered to the genitive of the noun, as *Brownii* for *Brownianum* (see Lindley's Introduction to Botany, 2 ed. p. 458).

The arrangement of the families and genera is principally in accordance with Professor Lindberg's admirable program, "*Utkast till en naturlig gruppering af Europas bladmossor med toppsittande frukt*" (1878), the most natural which has yet appeared; in this the cleistocarpous mosses—as in Mr. Mitten's system—are regarded as imperfectly developed forms of various stegocarpous families, with which they agree in everything but a separable operculum, and the genera are framed on a broader and more rational basis, just as our best botanists now deal with phænogamous plants.

Professor Lindberg's terms for the position of the reproductive organs are also adopted, as being more precise than those ordinarily used. His definition of these is as follows:—

A. GAMOECIA MONOICUM.

(♂ and ♀ on the same plant.)

1. Synoicous = ♂ and ♀ mixed together in the same inflorescence (*perichætium*). Ex. *Bryum bimum.*

2. Paroicous = ♂ and ♀ in the same inflorescence, ♂ naked and axillary to the lower bracts, ♀ covered by the uppermost bracts. Ex. *Bryum nutans.*

3. Autoicous = ♂ and ♀ each in a separate inflorescence (*andræcium* and *perichætium*). Ex. *Br. uliginosum.*

4. Heteroicous = synoicous + autoicous. Ex. *Br. pendulum.*

B. GAM. DIOICUM.

(♂ and ♀ on different plants.)

5. Dioicous = andrœcium and perichætium on different plants. Ex. *Br. capillare.*

C. GAM. POLYOICUM.

(♂ and ♀ both on the same plant and on different plants).

6. Polyoicous, under three forms:—

   a. Synoicous + dioicous. Ex. *Br. crudum.*
   b. Autoicous + dioicous. Ex. *Dicranum scoparium.*
   c. Heteroicous + dioicous. Ex. *Br. pallescens.*

To the same kind friend I am indebted for many suggestions and specimens, and also to various correspondents at home, to whom—as also to Mr. Baker, at Kew, and to Mr. Carruthers at the British Museum, for greatly facilitating my studies, and to Mr. Blair, F.L.S., for his careful reproduction of the drawings—I here offer my warmest thanks, and trust that by their valuable assistance the work will prove acceptable to all students in Bryology.

GLOSSARY.

Acaulis, stemless.
Accrescent, increasing in size.
Acicular, needle shaped.
Acinaciform, scimitar shaped.
Acrocarpous, fruit terminating the stem or axis.
Acrogenous, increasing at apex.
Acuminate, tapering gradually to a point.
Acuminulate, with a diminutive taper point.
Acutate, slightly pointed.
Acute, terminating at once in a point.
Adnate, joined together, adhering to the face of anything.
Adventitious, in an unusual position.
Æruginose, verdigris green.
Agglomerated, clustered together.
Aggregate, crowded.
Ala, a wing.
Alar cells, those at the basal angle of a leaf.
Albescens, *albicans*, *albidus*, whitish.
Alternate, one after another, but not opposite.
Amentula, the catkins of male inflorescence in *Sphagnum*.
Amorphous, without definite form.
Amplexicaul, clasping the stem.
Andræcium, the male inflorescence.
Androgynous, male and female organs on the same receptacle.
Annotinous, having annual shoots.
Annulus, a ring of vesicular cells between the lid and mouth of capsule.
Antheridia, the male reproductive organs.
Antherozoids, the fertilizing elements in the antheridia.
Anthoid, like a flower, as the male inflorescence in *Polytrichum*.
Anticus, inward.
Antidromous, applied to the attachment of leaves when the spirals run in opposite directions.
Apical, belonging to the apex or point.
Apiculus, an abrupt very short point continued from the lamina.
Apiculate, having an apiculus.
Apophysis, more correctly *hypophysis*.
Appendiculate, having appendages or additional parts.
Appressed, applied closely to the stem.
Archegonia, the female organs or rudimentary fruit.
Arcuate, bent like a bow.
Areolation, the network formed by the outline of cells.
Aristate, awned, ending in a small bristly point.
Articulated, jointed.
Ascending, directed upward.
Asperulous, slightly rough with little points.
Assurgent, ascending upwards.
Astomous, without a mouth.
Asymmetric, irregular in outline.
Attenuate, narrowing gradually.
Auriculate, having auricles or small lobes at base.
Autoicous, male and female inflorescence on the same plant; 3 forms:
1. *Cladautoicous*, the male on a proper branch.
2. *Gonioautoicous*, the male budlike and axillary on a female branch.
3. *Rhizautoicous*, male branch very short, cohering to the female by the rhizome.

Axillary, in the axil or basal hollow of a leaf or branch.

Badious, dull brown.
Basal or *basilar*, at the base or lowest part.
Bifarious, in two ranks.
Bigeminate, in two pairs.
Binate, in pairs.
Bipartite, divided nearly to base into two parts.
Bracts, the leaves enclosing the reproductive organs.
Byssaceous, divided into fine threads like wool.

Caducous, soon falling off.
Cæsious, glaucous green.
Cæspitose, forming matted tufts.
Cæspitulose, in very small tufts.
Calcicolous, growing on limestone.
Callose, hard and thick.
Calyptra, the membranous veil covering the lid.
Campanulate, bell shaped.
Canaliculate, channelled.
Canescent, rather hoary.
Capillary, hair-like.
Capitate, forming a head.
Capituliform, shaped like a capitulum or round head.
Carinate, keeled.
Carneous, flesh coloured.
Carnose, fleshy.
Cartilaginous, hard and tough.
Castaneous, chesnut coloured.
Catenulate, chain-like.
Cauline, belonging to the stem.
Cernuous, drooping, inclining a little.
Cervine, dark tawny.
Chartaceous, papery.
Chlorophyl, the green colouring matter of leaves.
Cilia, hair-like processes.
Ciliate, fringed with cilia.
Cinereous, ashy grey.
Circinate, bent circularly.
Cirrhate, curled.
Cirrhose, with a wavy hair-point.
Cladocarpous, the fruit terminating a lateral shoot.
Clavate, club shaped.
Cleistocarpous, the capsule not opening by a lid.
Coarctate, narrowed, squeezed up.
Cochleariform, round and concave like a spoon.
Collum, the neck or tapering base of the capsule.
Columella, the central pillar in the capsule.
Coma, the leaves or branches which form the crown of the stem.
Comose, ending in hairs.
Complanate, flattened.
Complicate, folded together.
Concave, hollow.
Concolorous, of one uniform colour.
Conduplicate, folded face to face.
Confertus, crowded together.
Confervoid, formed of fine threads.
Confluent, running together.
Congested, heaped together.
Connate, joined together.
Connivent, meeting in one point.
Conoid, like a cone.
Constricted, suddenly narrowed.
Continuous, uninterrupted.
Contorted, twisted like a rope.
Convolute, rolled up.
Cordate, heart shaped.
Coriaceous, leathery.
Corneous, horny.
Corniculate, with a horn-like appendage.
Cortical, belonging to the bark.
Costate, having a nerve.
Crenate, having convex teeth.
Crenulate, minutely crenate.

Cribrose, perforated like a sieve.
Crinitus, tipped with long, weak hairs.
Crisped, crispate, frizzled, curled and twisted in various ways.
Cristate, crested, or having an elevated notched ridge.
Croceus, orange-yellow.
Cruciate, arranged like a cross.
Crura, legs.
Cucullate, hooded, the apex curved inward like a slipper.
Cultriform, knife shaped.
Cuneate, wedge shaped.
Cuspidate, tapering gradually into a rigid point.
Cuticular, belonging to the cuticle or outer skin.
Cyathiform, cup shaped.
Cycle, the turn of a spiral in leaf order.
Cygneous, curved like a swan's neck.
Cymbiform, boat shaped.

Dealbatus, whitened.
Declinate, descending in an arched form.
Decumbent, reclining on the ground and rising again at apex.
Decurrent, applied to leaves when the lamina runs down the stem below the point of attachment.
Deflexed, bent downward through the whole length.
Dehiscence, mode of bursting.
Deltoid, triangular.
Dendroid, tree-like.
Dentate, toothed, having sharp teeth with concave edges.
Denticulate, minutely toothed.
Denudate, bared of leaves.
Deoperculate, freed from the lid.
Depauperate, starved or imperfectly developed.
Dependent, hanging down.
Depressed, flattened horizontally.
Descending, directed gradually downward.
Diaphanous, transparent.
Diaphragm, a partition.
Dichotomous, forked, divisions in pairs.
Diffuse, spreading widely.
Digitate, divided like fingers.
Dimidiate, split on one side.
Dimorphous, of two forms.
Dioicous, male and female infl. on separate plants.
Diplo, in comp. double.
Discoid, like a flat plate.
Dispositio, arrangement of leaves in spirals on the stem, *e.g.* disp. $\frac{3}{8}$ means that three complete turns will pass through 8 leaves.
Distichous, in two opposite rows.
Divaricate, straggling, spreading widely apart.
Divisural line, the line down the teeth of a peristome, through which they split.
Divergent, spreading outward from the centre.
Dorsal, on the back or posterior.

Echinate, with rigid bristles.
Echlorophyllose, without chlorophyl.
Ecostate, without a nerve.
Edentate, without teeth.
Elaters, spiral threads with the spores in Hepaticæ.
Elliptic, long oval, equally rounded at both ends.
Emarginate, notched at end.
Emersed, protruding upward.
Endostome, the internal peristome.
Endothecium, endothecal membrane, the internal lining of the capsule.
Enervis, without a nerve.
Ensiform, sword shaped.
Entire, free from any marginal division.
Epidermis, the cuticular or outer layer of cells.
Epiphragm, the dilated top of the columella in the Polytrichaceæ.
Epiphyllous, growing on leaves.
Equal, the two sides symmetric.
Equitant, in two rows, with the bases sheathing those above.
Erose, irregularly notched as if gnawed.
Exannulate, without an annulus.
Exasperate, roughened.
Excurrent, running out beyond the lamina.
Exospore, the investing cell of the spore.
Exostome, the outer peristome.
Exothecium, the outer membrane of the capsule.
Exserted, elevated above the surrounding parts.

Falcate, sickle shaped.
Fascicle, a bunch of leaves on a very short branch.
Fasciculate, collected in small bundles.
Fastigiate, all the branches reaching an equal height.
Fenestrated, perforated.
Fertile, bearing fruit.
—— *fid*, in comp: cleft.
Fibrillæ, fine threads.
Filiform, thread-like.
Fimbriate, fringed with processes.
Fissile, tending to split.
Flabelliform, fan shaped.
Flaccid, flabby.
Flagelliform, like the thong of a whip.
Flavescent, becoming yellow.
Flexuose, bending inward and outward.
Foramen, a small hole.
Forcipate, curved in like nippers.
Fornicate, arched.
Foveolate, pitted.
Fugacious, disappearing quickly.
Fulvous, tawny.
Funiform, like a rope.
Furcate, forked.
Furfuraceous, scurfy with little scales.
Fuscescent, tending to fuscous.
Fuscous, brown tinged with blackish.
Fusiform, spindle shaped.

Gamophyllous, having united leaves.
Geminate, in pairs.
Gemmaceous, like a small bud.
Gemmæ, budlike bodies capable of becoming plants.
Geniculate, bent like a knee.
Gibbous, very convex or tumid.
Glabrous, smooth.
Glaucescent, faintly glaucous.
Glaucous, covered with bluish white bloom.
Gonidia, cells filled with green granules.
Granulated, rough on the surface,
Gregarious, growing associated but not matted together.
Gymnostomous, without a peristome.
Gynœcium, the female inflorescence.
Gyrate, circinate.

Habit, general aspect of a plant.
Habitat, situation where a plant grows.
Hamate, hamulose, curved like a hook.
Hastate, halbert shaped.
Helicoid, twisted spirally.
Heteromallous, the leaves or branches turned in different directions.
Heteromorphous, of different forms.
Hirtus, covered with weak hairs.
Hispid, covered with rigid hairs.
Histology, the study of tissues.
Homodromous, when the leaf spirals run in a uniform direction.
Homomallous, the leaves or branches turned to one side.
Homomorphous, of like form.
Hyaline, clear as glass.

Hygrometric, moving by influence of moisture, applied to the setæ or teeth of peristome.
Hypogynous, below the female.
Hypophysis, an inflated part under the capsule.

Imbricated, overlapping like tiles.
Immarginate, not margined.
Immersed, covered by the surrounding parts.
Incanus, hoary.
Included, not extending beyond the surrounding organs.
Incrassate, thickened by internal deposit.
Incumbent, lying upon.
Indehiscent, not opening spontaneously.
Indumentum, clothing or covering.
Inflexed, bent inward.
Innovation, an annual shoot or extension of stem.
Insertion, mode of attachment.
Integerrimus, quite entire.
Internodes, spaces between the joints.
Involute, rolled inward.
Irregular, unsymmetric.

Juga, pairs of opposite leaves.
Julaceous, smooth slender and cylindric.

Laciniæ, small shreds.
Laciniate, cut or slashed.
Lacunæ, hollows.
Læte-virens, bright green.
Lævigatus, polished.
Lamellæ, small plates.
Lamina, the expansion of a leaf exclusive of nerve.
Lanceolate, narrowly elliptic and tapering to each end.
Lateral, attached to the side.
Lanuginose, woolly.
Lenticular, compressed like a double convex lens.
Leptodermous, thin coated, applied to capsules when soft and pliable.
Ligulate, strap shaped.
Limbatus, bordered by a part of another colour.
Linear, narrow, with the margins parallel.
Lingulate, tongue shaped.
Loricate, equally narrow throughout.
Lumen, the internal space or cavity of a cell.
Lunulate, crescent shaped.
Luridus, dirty brown.
Lutescent, pale yellow.

Mammillar, hemispherical with a projecting papilla.
Marginal, at the edge.
Marginatus, having a border of cells different in form or colour.
Median, in the middle.
Membranaceous, thin and semi-transparent.
Mitriform, torn equally at base.
Moniliform, like a necklace of beads.
Monoicous, male and female infl. separate but on the same plant.
Mucro, a short, abrupt point continued from the nerve.
Mucronate, provided with a mucro.
Mucronulate, with a very small mucro.
Multijugous, having many pairs of leaves.
Muricate, rough with sharp prominences.
Muticous, pointless.

Naked, without any appendages.
Navicular, boat shaped.
Neck, see collum.
Nerve, the midrib of a leaf.
Nidulant, nestling loosely.
Nitidus, smooth and polished.
Nodose, knobbed.
Nodulose, thickened into little knobs.
Nutant, nodding, hanging with the apex downwards.

Ob——, in comp. inversely, as obovate, inversely ovate.
Oblong, elliptic, obtuse at each end, with the longitudinal diameter 3—4 times the transverse.
Obsolete, scarcely apparent.
Obtuse, terminating gradually in a rounded end.
Obtusiusculus, rather obtuse.
Ochraceous, brownish yellow.
Ochrea, a thin sheath round the seta, terminating the vaginula.
——*oid* or ——*oides*, in comp. like, as mnioid, like the genus *Mnium*.
Oosphere, the central cell of the archegonium.
Operculum, the lid which closes the capsule.
Orbicular, circular.
Oval, elliptic and about twice as long as broad.
Ovate, elliptic with the lower end broader.

Pachydermous, thick coated, applied to the walls of capsules or to cells when firm and resisting.
Pagina, the expanded surface of the leaf.
Pallescent, palish.
Palmate, 5-lobed from a centre.
Pandurate or panduriform, fiddle shaped, obovate with a sinus at each side.
Papillæ, small rounded prominences.
Paraphylla, small foliaceous organs between the leaves, sometimes much cut or branched.
Paraphyses, succulent jointed threads growing with the reproductive organs.
Parenchymatous, cells with transverse ends.
Parietal, attached to the wall.
Paroicous, ♂ and ♀ in the same infl. ♂ naked in the axils of lower bracts.
Patent, spreading at an angle of 26°—45°
Patulous, ,, ,, 46°—90°
Pectinate, comb-like.
Peduncle or *pedicel*, the fruit stalk.
Penicillate, like a hair pencil.
Percurrent, running through the entire length.
Periandra, the bracts of male inflorescence.
Pericarp, the wall of the capsule.
Perichætium, the involucre surrounding the base of the fruit stalk, the separate leaves are perichætial bracts.
Perigonium, the involucre of male inflorescence.
Perigynium, the involucre of female inflorescence.
Peristome, the teeth round the mouth of capsule.
Persistent, remaining a long time.
Phyllotaxis, the order of arrangement of leaves.
Piliferous, ending in a fine weak point or hair.
Pinnate, having branches on two opposite sides.
Pistillidia, same as archegonia.
Plane, flat.
Pleurocarpous, producing fruit from the side of stem.
Plicate, plaited.
Plumose, feathery.
Polymorphous, of many forms.
Pore, a small aperture.
Posticus, outward or behind.
Predominant, very conspicuous.
Primordial utricle, the first layer deposited within the cell.
Processes, divisions.
Procumbent, spreading on the ground.
Proembryo, the first growth from the spore.
Proliferous, bearing an excessive development of parts.
Prosenchymatous, composed of cells with pointed ends.
Prothallium, an expanded frondiform proembryo.
Protonema, a branched filamentous proembryo.
Protoplasm, the formative material in living cells.

Pruinose, with minute elevations as if frosted.
Pseudannulus, an apparent annulus of non-vesicular cells.
Pseudopodium, an altered innovation, leafless, and often gemmiferous at apex.
Pugioniform, dagger shaped.
Pulvinate, like a cushion.
Punctate, with opake dots.
Pungent, ending gradually in a hard sharp point.
Pyriform, pear shaped.

Quadrate, square.

Rachis, the main axis.
Radical, at the root.
Radicles, root fibrils.
Radiculose, covered with radicles.
Ramenta, thin membranous scales.
Ramulus, a small branch.
Receptacle, the apex of stem in which the reproductive organs are fixed.
Reclinate, bending back.
Recurved, curved back.
Reflexed, suddenly bent back.
Regular, symmetrical.
Repand, slightly sinuous.
Repent, creeping.
Resupinate, inverted in position by twisting of the stalk.
Reticulate, netted with projecting lines.
Retuse, round at end with the centre depressed.
Revolute, rolled back.
Rhizinæ, hair-like radicles on the stem, also termed adventitious radicles.
Rhizome, a creeping subterranean stem.
Rimose, gaping in a chink.
Rostellate, with a little short beak.
Rostrate, beaked, terminating gradually in a long hard point.
Rosulate, arranged like a rosette.
Rubiginose, rusty red.
Rufescent, reddish brown.
Rugose, wrinkled.
Rugulose, slightly wrinkled.

Sanguineous, blood colour,
Saxicolous, growing on stones.
Scalariform, ladder-like.
Scalpelliform, like the blade of a penknife.
Scabrous, rough with minute warts.
Scaberulus, slightly scabrous.
Scariose, dry thin and semi-transparent.
Secund, turned to one side.
Semiamplexicaul, half clasping the stem.
Semiterete, half cylindric.
Septate, having partitions.

Sericeous, with a silky gloss.
Serrate, with sharp straight-edged teeth pointing forward.
Serrulate, with small serrations.
Sessile, without evident pedicel.
Seta, the fruit-stalk.
Setaceous, bristle shaped.
Sigmoid, curved like the letter S.
Sinuose or *sinuate*, having the margin with alternate concavities and convexities.
Spadiceus, a clear brown colour.
Spathulate, from a lineal base gradually obovate.
Spinulose, with minute prickles.
Sporangium, the sac holding the spores.
Spores, seeds.
Sporogonium, the capsule.
Squamose, scaly.
Squarrose, spreading out at right angles.
Stegocarpous, the capsule having a lid.
Stellate, radiating like a star.
Stipitate, attached to a stipes or foot-stalk.
Stolons, horizontal or descending shoots from the base of stem, with minute leaves.
Stomata, air pores in the wall of capsule.
Stramineus, straw coloured.
Striate, marked with striæ or slight furrows.
Strigose, covered with sharp stiff hairs, stiff and pointed.
Strumose, wich a swelling on one side at base.
Stylidium, the upper end of the archegonium.
Sub——, in comp. somewhat, as subacute rather pointed.
Subulate, awl shaped.
Sulcate, furrowed with longitudinal channels.
Surculus, a leafy upright shoot from the root.
Suture, line of junction of two parts.
Synoicous, antheridia and archegonia in one inflorescence.
Systylius, the lid continuing fixed to the columella, and thus elevated above the capsule when dry.

Terete, cylindric and tapering.
Teretiusculus, very slightly terete.
Terminal, at the end.
Theca, the capsule.
Tomentose, covered with tomentum or woolly fibrils.
Tortuose, irregularly bending and turning.
Trabeculate, with transverse bars on the teeth of peristome.
Triquetrous, triangular.
Truncate, cut off abruptly.
Tuberculate, covered with minute knobs.
Turgid, slightly swollen.
Turbinate, top shaped.
Tympanum, see epiphragm.

Umbonate, round with a projecting point in the centre.
Umbraculiform, umbrella shaped.
Uncinate, hooked, curved back at point.
Undulate, with an alternately convex and concave margin.
Unequal, the two sides not symmetric.
Unguiculate, ending in a point like a claw.
Urceolate, pitcher shaped.
Utricles, oblong, somewhat inflated cells in *sphagnum*.

Vaginant, sheathing.
Vaginula, a sheath round the base of the seta where it joins the receptacle.
Vaguely, without any definite direction.
Valves, parts which separate in a definite manner.
Vascular, having vessels.
Veil, the calyptra.
Ventral, in front or anterior.
Ventricose, bulging on one side.
Vermicular, thick cylindric, and bent at certain points.
Verrucose, covered with wart-like prominences.
Vesicular, inflated like a bladder.
Villi, branched processes on the stem.
Villose, covered with villi.
Vittate, striped.

♂, male. ♀, female.
——, between, as 3—6, between 3 and 6.
!, examined by the author.
! !, in the author's herbarium,
p.p., partly.

FAMILIES OF ACROCARPOUS MOSSES.

Sect. 1. SCHISTOCARPI.

1. ANDREÆACEÆ.

Sect. 2. STEGOCARPI.

* Anarthrodontei.

2. BUXBAUMIACEÆ.

3. GEORGIACEÆ.

4. POLYTRICHACEÆ.

** Arthrodontei.

† *Gamophylleæ.*

5. FISSIDENTACEÆ.

†† *Eleutherophylleæ.*

6. LEUCOBRYACEÆ.

7. DICRANACEÆ.

8. GRIMMIACEÆ.

9. TORTULACEÆ.

10. WEBERACEÆ.

11. SCHISTOSTEGACEÆ.

12. SPLACHNACEÆ.

13. OEDIPODIACEÆ.

14. FUNARIACEÆ.

15. BRYACEÆ.

16. BARTRAMIACEÆ.

17. MEESEACEÆ.

18. MNIACEÆ.

ANDREÆACEÆ.

MAY 1ST, 1880.

ANDREÆA. EHRH.

1. **A. petrophila.** EHRH.
2. — **alpina.** (DILL.) SM.
3. — **crassinervis.** BRUCH.
4. — **Rothii.** WEB. MOHR.
5. — **nivalis.** HOOK.

MUSCI ACROCARPI.

Fruit terminating the axis of stem, or becoming apparently lateral through being pushed aside by a new shoot.

Sect. 1. *SCHISTOCARPI.*

Capsule splitting vertically into valves united at base and apex.

Fam. 1. ANDREÆACEÆ.

Mosses with the habit of the genus *Grimmia*, always growing on quartzose rocks, attached by a few radicles, and forming small, dense, very fragile, fuscous, rufous or black tufts. Stems rigid, slender, dichotomous or fasciculate. Leaves in 5 or 8 ranks, patent, secund or falcato-secund; smooth or papillose, nerved or nerveless, ovate, lanceolate or subulate; the cells minute, incrassate, rectangular at base, punctiform or angular above.

Fruit terminal, solitary, enclosed in the large perichætium up to maturity, then exserted on the elongated vaginula. Capsule ovate-oblong, without operculum, splitting into 4, or rarely 6—8 valves, united at apex, closed when moist, gaping widely and depressed when dry; the wall of five cell-strata, without a distinct sporangial membrane; columella cylindric, extending from base to apex. Calyptra campanulate, closely adhering to capsule, mitriform, torn irregularly. Spores smooth. Male inflorescence gemmiform, terminal, or lateral by arrest of development.

The species of *Andreæa* were united by the early authors with *Jungermannia*, but they agree with the true mosses in all points of structure, the only aberrant character being the valvate dehiscence of the capsule, giving them a superficial resemblance to that genus of *Hepaticæ*, to which also they slightly approximate in the form of their prothallium. Their true place appears to be between the *Sphagnaceæ* and frondose mosses, since they present certain points of agreement with the former, in the capsule being at first enclosed in a similar large saccate calyptra, and then elevated on an elongated pseudopodium, and also in the prothallium partaking somewhat of the lobate form seen in *Sphagnum*.

The plants entirely agree with the genus *Grimmia* in habit, mode of growth, and structure of leaves, but they deviate so widely from it in the fruit, that I prefer to follow Bridel in retaining them in a separate section. My friend Lindberg places them as the lowest family of the acrocarpous mosses, and next after the *Grimmiaceæ*.

The *Andreæaceæ* are entirely confined to granite or slate rocks and boulders, and to mountains, stony regions, or the high latitudes of the arctic and antarctic zones, and this no doubt accounts for the great uniformity in their structure and habit. The pachydermous nature of their cells gives the leaves an almost cartilaginous texture, and thus enables them to resist the pelting storms which harass the elevated districts they inhabit, and produce that debris of their tissues and of the adjacent rocks, which always more or less infiltrates the tufts. This thickened cell tissue, combined with the dark color, greatly obscures the definition of the nerve and cells under the microscope, and a preparatory treatment with Liq. Sodæ or Potassæ will be found of the greatest assistance in their examination; by placing a moistened branch in a few drops of the caustic alkali on a slide, heating it over a spirit lamp, and then soaking well in clean water, the leaves become soft and flaccid, and every cell clearly defined.

The family includes but a single genus of about 50 species, which may be arranged in three sections.

1. **Euandreæa.** Lindb. Marked by its distinct convolute perichætium, and deeply 4-fid capsule.
2. **Chasmocalyx.** Lindb. Without any evident perichætium, and deeply 4-8 valved capsule; includes only *A. nivalis* Hook. and *australis* F. Muell.
3. **Acroschisma.** Hook. Wils. Having the capsule cleft only at the upper end into 4-8 valves; comprising *A. Wilsoni* Hook. and *densifolia* Mitt.

The greatest number of species is found in the islands of the antarctic regions, but a fair proportion is also met with on the elevated mountains of South America, while Northern India and Australia also possess certain endemic forms; in Europe the Scandinavian peninsula is the head-quarters of the family.

Several minute branched lichens *Ephebe pubescens*, *Leptogium muscicola*, &c., occasionally infest the leaves, but in the S. American *A. arachnoidea C. Müll;* the leaves are overrun with minute filaments, truly produced by the plant itself. For an exhaustive account of the development and structure of these plants, we may refer to the admirable paper of Kühn "*Entwickelungsgeschichte der Andreæaceen*" (Leipzic, 1870), and an equally valuable one by Berggren "*Studier öfver Mossornas byggnad och utveckling*" in Act. univ. Lund. IV. n. 12 (1867); both of which are illustrated by excellent plates.

ANDREÆA. Ehrhart.

Hannov. Mag. 1778, 101 Stück, p. 1601; et Beitr. i. pp. 15 et 180 (1787).

Acrocarpous mosses of a reddish, brown or black color, growing in small dense fragile tufts. Capsule sessile on the elongated vaginula, splitting into 4—rarely 6 or 8—valves, united at base and apex. Calyptra thin, adherent, mitriform, torn irregularly.

Dillenius was the first author who recognized any species of the present genus, and he described and figured two in his Historia Muscorum, under the names "*Lichenastrum alpinum atrorubens teres, calycibus squamosis*" (*A. alpina*),

and "*Lichenastrum alpinum nigricans, foliis capillaceis reflexis*" (*A. falcata*). Linnæus also had two species to which he referred the Dillenian mosses, and placed under *Jungermannia* as *J. alpina* and *J. rupestris*, but he evidently had no correct idea of them, as the specimens in his herbarium belong as regards the former to *A. petrophila* EHRH., and the latter to *A. obovata* THED.

The genus was first established by Ehrhart in honor of his friend J. G. R. Andreæ, an apothecary of Hanover, and his excellent character of it stands as follows: "Perichætium squamosum; squamæ lanceolatæ, carinatæ, imbricatæ. Anthophorum longitudine perichætii. Calyptra conica brevissima. Stylopodium nullum. Conioecium oblongum, subtetragonum, 4 sulcatum. Apophysis turbinata. Valvulæ 4 carinatæ, angulares, basi apophysi apicibus conjunctorio adnatæ. Suturæ laterales ex medio sursum deorsumque versus dehiscentes. Conjunctorium obtusiusculum. Dissepimentum nullum. Styliscus cylindricus. Sporæ subtilissimæ."

Ehrhart knew only one species *A. petrophila*, and confusion at once crept in, for this was universally regarded as identical with our *A. alpina*, due no doubt to the curious fact, that this common British species is almost entirely absent from the continent of Europe; then Hedwig defined the 4 valves of the capsule as peristomial teeth united to a persistent operculum, and the confusion was complete when he and Mohr made *A. petrophila* EHRH. into two species, *A. alpina* and *rupestris*, which they considered to be synonymous with those of Dillenius, and in this error were followed by nearly all subsequent writers down to our own day, until Thedenius cleared matters up in his classical paper, "*Observationes de enervibus Scandinaviæ speciebus generis Andreææ*," and Schimper finally settled the genus in his exquisite monograph in the last part of the Bryologia Europœa. It may be noted that the British authors who possessed the true *A. alpina* still retained the name *rupestris* for *A. petrophila* EHRH., which had been given to that form of it with secund leaves, the var. *homomalla*.

That Mohr, however, was not altogether satisfied with his determination is evident from what he says under *A. rupestris*, HEDW.? (Bot. Taschenb, p. 384) as follows:—"It is not to be denied that the leaves of *A. alpina* and *rupestris* do not differ, except that in the latter the apex of the leaf is laterally curved, from which the leaves become remarkably homomallous. Hedwig incorrectly ascribes to *A. alpina*, leaves *smooth at back;* to *A. rupestris*, leaves *muricate* or *papillose at back;* both are truly very lightly papillose at back under a high power." Bridel was evidently of opinion that they were not distinct, for he states that he considers these forms so similar that they can with difficulty be regarded as proper species. It is also clear that Hedwig had specimens of the true *A. alpina*, but failed to distinguish them, for that species has smooth cells, but *A. petrophila* has them distinctly and coarsely papillose. With respect to this important character of smoothness or papillosity of the cell walls, it may be well to refer to a paper by Schliephacke, "*Ueber das genus Andreæa*," in Verhandl. Zool. Bot. Gesells. Wien XV., p. 423 (1865), where these characters are contrasted, both in the natural state and after treatment with caustic alkali.

The other European *Andreæas* not found in Britain are, *A. papillosa* LINDB., an excellent species from Spitzbergen and Mt. Tjidtjak, in Lapland; *A. obovata* THED., *A. Hartmani* THED., and *A. Blyttii* SCHIMP., all three

confined to Scandinavia. I agree with Lindberg in regarding *A. Thedenii* SCHIMP., as a var. of *A. Hartmani*, and *A. sparsifolia* ZETTERST., as a var. of *A. petrophila*, very near to *alpestris*.

CLAVIS TO THE SPECIES.

Leaves nerveless.
Leaves ovato-lanceolate, papillose, entire *petrophila.*
Leaves obovate-spathulate, apiculate, smooth, serrate at basal margin. *alpina.*

Leaves nerved.
Leaves oblong at base, subulate, smooth; nerve toward apex without any lamina. *crassinervis.*
Leaves ovate at base, lanceolate, smooth; nerve flattened, the lamina narrowed but distinct to apex. *Rothii.*
Leaves oblongo-lanceolate, papillose, laxly areolate; nerve narrow, the lamina broad and distinct to apex. *nivalis.*

Sect. 1. *EUANDREÆA.* LINDB.

Leaves and perichætial bracts different in form, the latter erect and convolute, nerveless, or scarcely nerved.

* *Leaves nerveless.*

1. A. PETROPHILA. *Ehrh.*

Autoicous; in small, fragile, olive green or fuscous tufts. Leaves nerveless, crowded, from an erect base, divergent, sometimes secund, entire, papillose at back, ovate or ovato-lanceolate, the apex muticous and somewhat obliquate; areolation incrassate, punctiform and orbicular at apex, sinuoso-rectangular at base. Perichætial bracts large, convolute. (*T. Ia.*)

SYN.—*Jungermannia alpina* L. Sp. Pl. 1135, n. 22 (1753); et 2 ed. ii, 1601 (1763), p.p. et herb. WEB. Spic. Fl. Gött. 152, excl. syn. (1778). RETZ. Fl. Scand. Prod. 221, excl. syn. (1779). ROTH Fl. Germ. i, 485 (1788). Fl. Dan. t. 1002, f. 1 (1790). LILJEBL. Svensk Fl. 323 (1792). SCHRAD. Spic. Fl. Germ. 76 (1794). HUEB. Hepat. Germ. 301, excl. syn. pl. (1834).

Andr. petrophila EHRH. in Hann. Mag. 1784, 9 Stück, 140; Beitr. i, 192 (1787), excl. syn. et Dec. Crypt. n. 67 (1786). HOFFM. Deutsch. Fl. ii, 80 (1796). STURM Deutsch. Fl. fasc. 2, 3, f. b. C. D. (1799). THEDEN. in Nya Bot. Not. 1849, p. 78, f. 37-44. HARTM. Skand. Fl. 6 ed. 437 (1854). ZETTERST. Mon. Andr. Scand. 42 (1855). SCHIMP. Bry. Eur. vi, Mon. 13, T. 1 (1855); Syn. Musc. Eur. 660 (1860) et 2 ed. 812 (1876). SULL. Moss. Unit. St. 13 (1856). HOOK. FIL. Fl. Tasm. ii, 161 (1860); Handb. N. Zeal. Fl. 400 (1867). BERK. Handb. Br. M. 309 (1863). MITT. Jour. Lin. Soc. xii, Bot. 628 (1869). MILDE Bry. Siles. 256 (1869). DE NOT. Epil. Briol. Ital. 746 (1869). HOBK. Syn. Br. M. 21 (1873).

A. petrophila, α. *alpina* et β. *rupestris* WALLROTH Fl. Crypt. Germ. 92, excl. syn. plur. (1831).

A. rupestris HEDW. Sp. Musc. 47, T. 7, f. 2, excl. syn. (1801). SMITH Fl. Brit. 1178, excl. syn. (1804); Eng. Bot. t. 1277, excl. syn. plur. (1804). P. BEAUV. Prodr. 42 (1805). BRID. Musc. Rec. ii, P. 1, 44 (1806). WEB. MOHR. Bot. Tasch. 384, t. 11, f. 5, 6 (1807). HOOK. Trans. Lin. Soc. X, 391, T. 31, f. 2, excl. syn. plur. (1810). SCHWAEGR. Supp. I, P. 1, 42 (1811). HOOK. TAY. Musc. Br. 2, t. 8 (1818). SMITH Comp. Fl. Br. 3 ed. 163 (1818). HOOK. Fl. Scot. P. 2, 121 (1821). GRAY Nat. Arr. Br. Pl. i, 709, 2 (1821). BRID. Bry. Un. ii, 726 (1827). SPRENG. Syst. Veg. iv, 216 (1827). SWARTZ Adnot. Bot. 181, excl. syn. L. et DILL. (1829). HOOK. Br. Fl. ii, 5 (1833). Fl. Dan. Tab. 2125, f. 2, excl. syn. plur. (1834). MACKAY Fl. Hib. P. 2, 7 (1836). HARTM. Skand. Fl. 3 ed. 315 (1838). GAROV. Bry. Austr. exc. 10 (1840). ANGST. Disp. Musc. 23 (1842); et in FRIES Summa Veg. Sc. 97 (1846). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 71 (1848). C. MUELL. Syn. Musc. i, 6, excl. syn. L. et DILL. (1849). WILS. Bry. Brit. 12, t. 8 (1855).

A. alpina TURN. Musc. Hib. 13 (1804). BRID. Musc. Rec. ii, P. 1, 45 (1806); et Mant. Musc. 207 (1819). WEB. MOHR. Bot. Tasch. 383, t. 11, f. 3, 4 (1807). SCHWAEG. Suppl. I, P. 1, 42 (1811). VOIT Musc. Herbip. 130 (1812). WAHLEN. Fl. Lapp. 306, excl. syn. L. DILL. et Eng. Bot. (1812); Fl. Carpat. 334, excl. syn. L. et. Eng. Bot. (1814); et Fl. Upsal. 392 (1820). SWARTZ Summ. Veg. Scand. 38 (1814). LILJEBL. Svensk Fl. 3 ed. 569 (1816). ASPEGREN Blek. Fl. 74 (1823). FRIES Stirp. Agr. Femsjon. 29 (1825). BRID. Bry. univ. ii, 728, p.p. (1827). SWARTZ Adnot. Bot. 180, excl. syn. L. et DILL. (1829). HARTM. Skand. Fl. 2 ed. 354 (1832). WAHLEN. Fl. Suec. 2 ed. ii, 809 (1833). DE NOT. Syll. Musc. n. 480 (1838). GAROVAGL. Bry. Austr. exc. 10 (1840). ANGSTR. Disp. Musc. 23 (1842); et in FRIES Summ. Veg. Sc. 97 (1846). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 71 (1848).

A. alpina β *subsecunda* WAHLEN. Fl. Lapp. 306 (1812); et Fl. Suec. 2 ed. 809 (1833). SWARTZ Summ. Veg. 38 (1814). LILJEBL. Sv. Fl. 3 ed. 569 (1816). HARTM. Sk. Fl. 380 (1820). FRIES Stirp. Agr. Femsjon. 29 (1825).

Jungerm. rupestris HUEB. Hepat. Germ. 303, excl. syn. plur. (1834).

Autoicous; rufescent, olivaceous or blackish. Stems cæspitose, ½-1 in. high, nearly erect, simple or dichotomous. Leaves crowded, nerveless, varying much in form, direction, and texture, from an erect base, suberect and laxly appressed when dry, patent and divaricate when moist; straight or a little incurved at apex, often secund on the young surculi; ovato or oblongo-lanceolate, muticous or with a minute apiculus, concave, generally obliquate at apex and hence slightly asymmetric, the margin entire, subinflexed, the point often with a hyaline border and crenulate. Areolation dense, sinuoso-linear at base, dot-like and orbicular at apex, the cells strongly and obtusely papillose at back, especially in the upper part of leaf.

Perichætium large, outer bracts imbricated, inner convolute, very broad, oblong, smooth, soft, and yellowish. Capsules small, pale at base, rufo-fuscous. Male infl. on distinct branches (*cladautoicous*), bracts three, very concave, broadly ovate, pointed; antheridia 5-7.

HAB.—Mountain rocks; common. Fr. 6-8.

A green obtuse leaved form on The Cobbler, Arrochar (*George* 1879) ! !

It is only in mountainous districts that this little moss forms a conspicuous object on the rocks, which are dotted over with its beautiful brown or black cushions, so slightly attached at the root that it is but seldom good herbarium specimens can be procured. The number of varieties quoted under this species are evidence of the varied aspects it presents to us, but however much the leaves may differ in color, form, or direction, their cell structure exhibits great uniformity, and indicates that sound characters for the distinction of species must chiefly be based on this feature. The pale color of the base and neck of the capsule in this plant is very marked.

Var. β. **Homomalla.** THEDEN.

Stems short, laxly pulvinate, olivaceous, green above, fuscous below. Leaves ovate or oblongo-lanceolate, more or less falcato-secund, obtuse.

SYN.—*Andr. rupestris* WEB. & MOHR, SMITH, HOOK., C. MUELL. et plur. auct. cit. sub forma typica.

Andr. petrophila Var. γ. *homomalla* THEDEN. in Nya. Bot. Not. 1849, p. 79, fig. 48-54. SCHIMP. Syn. Musc. 661, et 2 ed. 813. ZETTERST. Mon. Andr. Scand. 43.

HAB.—Glen Callater, Braemar (*Hunt*) ! ! Castel-y-Gwynt, Carnarvon at 3000 ft. (*Beckett* 1880) ! !

This appears to be a form rather than a variety, as the secund disposition of the foliage is found more or less developed in varieties differing widely in other respects. The obtuse, obliquate apex of the leaf and large size of the upper cells may prove more characteristic. It seems to be only sparingly distributed both here and on the continent.

Var. γ. **Acuminata.** SCHIMP.

Plants more robust, olive green or blackish. Leaves spreading, longer and more acuminate, with longer papillæ.

SYN.—*A. petrophila* Var. β. *acuminata* SCHIMP. B. E. vi, Mon. 13, t. II, β; Synops. Musc. 661, et 2 ed. 813.

HAB.—Rocks on the higher mountains.

Glen Callater, Braemar (*Fergusson* 1868) ! ! Ben Macdhui (*Hunt* 1871) ! ! Cader Idris (*Pearson* 1876) ! ! Strachan, Kincardine, and Rona's hill, Shetland (*Sim* 1878) ! ! Slack of Birnie, Fourdoun (*Sim*) ! ! Ben Nevis, at 4000 ft. abundant (*George* 1879) ! ! Abergynalwyn (*Whitehead* 1879) ! !

Closely allied to the varieties *robusta*, *flaccida* and *sylvicola*, and perhaps with them only constituting one good variety characterized by the taper-pointed leaves.

Var. δ. **Flaccida.** SCHIMP.

In soft, black tufts, with branched, flexuose stems. Leaves squarroso-patent, lanceolate, pointed, rather obtuse.

SYN.—*A. petrophila* Var. γ. *flaccida* SCHIMP. B. E. vi, Mon. 13, t. II, γ; Syn. Musc. 661, et 2 ed. 813.

HAB.—Rocks in Glen Callater, Braemar (*Hunt* 1871) ! ! Canlochan (*Hunt* 1868) ! !

This is a more robust plant than the Var. *alpestris*, which it somewhat resembles in the form and direction of the leaves, but these in the dry state are widely divergent or even subsquarrose, and also of a larger size.

Var. ε. **Sylvicola.** SCHIMP.

In small, lax tufts, short, slender, decumbent at base. Leaves small, partly secund, rather distant, longly lanceolato-acuminate, acute.

SYN.—*A. petrophila* Var. ε. *sylvicola* SCHIMP. B. E. vi, Mon. 13, t. II, ε; Syn. Musc. 661, et 2 ed. 813.

HAB.—Ben Macdhui, Glen Callater and Loch Kandor (*Hunt* 1871) ! !

Var. ζ. **Gracilis.** SCHIMP.

Stems slender, branched, rufescent; surculi straight, elongated; leaves more distant, suberect, broadly oblongo-lanceolate; perichætium narrow, cylindric.

SYN.—*A. petrophila* Var. ζ. *gracilis* SCHIMP. B. E. vi, Mon. 13, t. II, ζ; Syn. Musc. 661; et 2 ed. 813.

HAB.—Elevated mountain districts.

Stye-head pass, Borrowdale (*Hunt* 1871) ! ! Cader Idris (*Pearson* 1874) ! ! Loch-na-Gar, Braemar (*Sim* 1876) ! ! Ben Nevis, near summit (*George* 1879) ! !

Two forms of this variety occur, one rufous brown, to which the Braemar plant belongs, the other, more slender and of a beautiful rosy purple tint, represented by Mr. George's specimens. The first is identical with Stockholm specimens from Lindberg, and readily distinguished by its straight branches and suberect leaves.

Var. η. **Alpestris.** THEDEN.

In densely cushioned black-brown tufts. Stems very slender, much branched. Leaves small, crowded, closely imbricated when dry, obtuse, laxly areolate, less distinctly papillose.

SYN.—*And. petrophila* Var. *alpestris* THED. in Nya Bot. Not. 1849, p. 79, fig. 45-47. HARTM. Skand. Fl. 6 ed. 437. ZETTERST. Mon. Andr. Scand. 43.

Andr. alpina DE NOT. Syll. Musc. p.p.

Andr. alpestris SCHIMP. Bry. Eur. vi, Mon. 16, T. IV., Syn. Musc. Eur. 662; et 2 ed. 814. DE NOT. Epil. Briol. Ital. 747. HARTM. Skand. Fl. 7 ed. HOBK. Syn. Br. M. 21.

HAB.—Wet rocks on the higher mountains of Scotland; rare.

Glen Callater, Braemar (*Croall* 1853) ! ! Morone, Braemar (*Hunt* 1871) ! ! Ben Challum, Perthshire (*McKinlay* 1866) ! ! Uam Mhor, Perthshire (*McKinlay* 1865) !

This variety appears to stand midway between *A. petrophila* and *A. obovata*, but agrees entirely with the first in the form and areolation of the leaf, though differing remarkably in aspect, by its very slender, branching stems, and smaller, closely imbricated leaves. None of our specimens come quite up to the standard of the Scandinavian plant, being thicker and more stunted and thus as it were intermediate between ordinary *A. petrophila* and the type of the variety; this is especially the case with the Perthshire specimens.

Var. θ. **Sparsifolia.** (ZETT.) LINDB.

In small, lax tufts; olivaceous or rufescent; stems very slender and fragile, flexuose, with few branches. Leaves small, distant, spreading, the uppermost secund or subfalcate, lanceolate, gradually acuminate, acute, less distinctly papillose.

SYN.—*Andr. sparsifolia* ZETTERST. Mon. Andr. Scand. 32. SCHIMP. Synops. 665; et 2 ed. 817. DE NOT. Epil. Briol. ital. 746. HARTM. Sk. Fl.

HAB.—Near the summits of the higher mountains. Very rare.

Summit of Ben More, Perthshire (*George* 1875).

Although smaller in all its parts than Norwegian specimens, for which I am indebted to the kindness of Prof. Lindberg, the Scotch plant is unquestionably the same, and it is equally certain that it must take its place in the long series of forms referable to *Andr. petrophila*, of which it is the most marked variety, a position we prefer to that of establishing intermediate *subspecies*. The areolation is also less completely circular than in the Scandinavian plant, which, it may be mentioned, grows associated with *Andr. obovata* and *Hartmani*, two species still desiderata in the British Flora.

2. **A. ALPINA.** (*Dill.*) *Sm.*

Autoicous; tall, erect, in soft, glossy, chocolate brown tufts. Leaves nerveless, spathulato-obovate, subpanduriform, imbricated when dry, abruptly acuminate, with an acute apex, smooth, the margin obtusely denticulate at base; perichætial bracts ovate-oblong, convolute.

Syn.—*Lichenastrum alpinum atrorubens teres, calycibus squamosis* Dillen. Hist. Musc. 506, n. 39, t. 73, f. 39 A-D (1741); et herbar.

Jungermannia alpina L. Sp. Pl. 1135, n. 22 (1753); et 2 ed. ii, 1601, n. 23 (1763), p.p. non herbar. Huds. Fl. Angl. 436, n. 24 (1762), et 2 ed. ii, 517 (1778). Wither. Bot. Arr. Br. Veg. ii, 698, n. 30 (1776). Lightf. Fl. Scot. ii, 787, n. 22 (1777). Laichard. Veg. Eur. ii, 657 (1791). Murray Syst. Veg. 803 (1798). Hull Br. Fl. P. 2, 281 (1799). Dicks. Hort. sicc. fasc. 3, n. 23.

Andreæa alpina Smith Fl. Brit. 1179, excl. syn. nonnull. et Eng. Bot. t. 1278 (1804); et herbar. Hook. Trans. Lin. Soc. X, 388, excl. syn. plur. T. 31, f. 1 (1810). Smith Comp. Fl. Br. 3 ed. 163 (1818). Hook. Tayl. Musc. Brit. 1, t. 8 (1818). Hook. Fl. Scot. P. 2, 120 (1821). Gray Nat. Arr. Br. Pl. i, 709, 1 (1821). Grev. Arn. Mem. Wern. Soc. IV, t. 7, f. 1-4 (1822). Spreng. Syst. Veg. iv, 216 (1827). Brid. Bry. univ. ii, 728, p.p. (1827). Hook. Br. Fl. ii, 5, excl. syn. plur. (1833). Mackay Fl. Hib. P. 2, 7 (1836). C. Muell. Syn. Musc. i, 7 (1849). Thed. in Bot. Not. 1849, p. 77. Hartm. Skand. Fl. 6 ed. 437 (1854). Wils. Bry. Brit. 11, t. 8 (1855). Zetterst. Mon. Andr. Scand. 37 (1855). Schimp. Bry. Eur. vi, Mon. 19, t. VI (1855); Syn. Musc. 666 (1860), et 2 ed. 818 (1876). Berk. Handb. Br. M. 309, t. 2, f. 6 (1863). Hobk. Syn. Br. M. 21 (1873).

Andr. rupestris Var. *gigantea* Swartz in Herb. Turner.

Autoicous; in dense, blackish-red, glossy tufts. Stems erect, 1-3 in. high, fastigiate, much branched, filiform and naked at base. Leaves nerveless, densely crowded, closely appressed at base when dry, with the apices patent: erecto-patent when moist, with the apices straight or subincurved, smooth, glossy, obovate, contracted a little below the middle, or from an oblong base, spathulate, with a short acumen at apex; the margin obtusely serrate above the base, entire in upper part. Areolation flexuoso-linear at base, minute and rounded above, in parallel rows.

Perichætium large, of 6-7 leaves, bracts resembling the comal leaves, apex with a hyaline border, innermost convolute, gradually acuminate; capsule oblong-ovate, black-brown, on a dark pseudopodium.

Male infl. obtusely gemmiform, paraphyses very long, flexuose, clavate, bracts broadly ovate. (*T. Ib.*)

HAB.—Mountain rocks, not uncommon. Fr. 6-7.

Very fine in the Lake district as in Ennerdale and Easdale (*Baker*)!! Teesdale (*Spruce*)!! Cader Idris (*Whitehead*)!! Llyn-y-Cwm (*Baker*)!! Twll-du (*Holmes*)!! *Scotland*—Ben Lomond and Ben Lawers (*Braithwaite*)!! Braemar (*Hunt*)!! Broad-leaved form, The Cobbler, Arrochar (*George* 1879)!! Flaccid dwarf form, rocks in stream, Glen Croe, Arrochar (*George* 1879)!! Small form sent as *A. obovata*, Glen Callater (*Fergusson* 1868)!! *Ireland.*—Kerry, Wicklow and Galway (*Moore*).

Common as this beautiful moss is with us, it is utterly unknown on the continent, with the exception of a few stations in Norway, and has thus led to great confusion in the synonymy of the older authors. In the Linnean herbarium it is represented by *A. petrophila*, and in Sweden by *A. obovata*, a species having leaves gradually lanceolate in the upper half, the basal margin quite entire, and the apical cells much larger and more angular.

Var. β. **Compacta.** HOOK.

In densely cushioned tufts of a lurid blackish purple color; the branches straight, equal and fastigiate; the leaves closely imbricated.

SYN.—*Andr. alpina* Var. γ *compacta* HOOK. in Trans. Lin. Soc. X, 389 (1810). BRID. Bry. univ. ii, 730.

HAB.—Elevated mountains in Scotland and Wales.

Ben Nevis (*Hooker* and *Borrer* 1806)! On the ground, summit of Great Glyder, Carnarvon (*Holmes* and *George* 1878)!!

Var. γ. **Flavicans.** HOOK.

Stems elongated, filiform, the leaves more distant, laxly imbricated, yellowish.

SYN.—*Andr. alpina* Var. β. *flavicans* HOOK. in Trans. Lin. Soc. X, 389 (1810). BRID. Bry. univ. ii, 730.

HAB.—Scotland, summit of Ben Nevis (*Hooker* and *Borrer* 1806)!

This marked variety has a strong superficial resemblance to *A. Hartmani*, but is readily distinguished by its more acute leaves, and much more minute areolation.

* * *Leaves nerved.*

3. A. CRASSINERVIS. *Bruch.*

Autoicous; in brown-black tufts. Leaves patent or falcato-secund, from an oblong base, subulate, nerve strong, flattened below, passing into the terete sub-papillose subula. (*T. Ic.*)

SYN.—*A. crassinervia* BRUCH in Denkschr. Akad. Münch. 1828, p. 279, n. 1, t. 10. RABENH. Deutsch. Krypt. Fl. ii, P. 3, 72 (1848). C. MUELL. Syn. Musc. i, 10 (1849). SCHIMP. Bry. Eur. vi, Mon. 23, t. XI (1855); Syn. Musc. Eur. 668 (1860), et 2 ed. 820 (1876). HARTM. Skand. Fl. SULL. Moss. Un. St. 13 (1856). LINDB. in Journ. Lin. Soc. xi, 460 (1870). HOBK. Syn. Br. M. 22 (1873).

Autoicous; in rigid depressed dark brown or black, slightly glossy tufts. Stems sparingly subfastigiate-branched $\frac{1}{3}$-$\frac{2}{3}$ in. high, very fragile. Leaves crowded, divaricate, usually falcato-secund, from an oblong very

concave base, subulate, smooth, quite entire at margin, nerve semiterete, faint at base, running out into a terete papillose subula. Areolation at apex very small, hexagono-quadrangular, larger at base, rectangular in the middle, quadrate at margin.

Perichætium convolute, outer bracts oblongo-lanceolate, erecto-patent, nerveless at base, broadly nerved at apex, inner convolute, nerveless, elongate-oblong, shortly apiculate. Capsule oblong, brown, short-necked. Male infl. an ovate bud, inner bracts broadly ovate, nerveless.

HAB.—Alpine rocks. Fr. 7-8.

Dewerstone rocks, Dartmoor (*Holmes*) ! ! Falcon clints, Teesdale (*Slater* 1853) ! ! Hebden bridge (*Hunt* 1864) ! ! Soccoth hill, Arrochar (*McKinlay* 1866) ! ! Grisedale, Cumberland (*Baker* 1867) ! ! Near Buttermere (*Hunt*) ! ! Pen-y-Ghent, Yorks., and Tintwistle, Cheshire (*Whitehead* 1868) ! ! Pont Aberglaslyn (*Wilson* 1869) ! ! Cader Idris (*Pearson* 1876) ! ! Tyn-y-Gros, Snowdon (*Wild* 1877) ! ! Dumyat, Stirling (*Croall* 1877) ! ! Upper Lough Bray, Ireland (*Moore*). · Abergynalwyn (*Whitehead* 1879) ! !

Close as this stands to the next species it may readily be recognized by the subulate point, composed apparently of the excurrent nerve, but which, after treatment with caustic alkali, will be seen to have a border of a single row of cells, which observed in the dry state by reflected light stand out as papillæ.

4. A. ROTHII. *Web. Mohr.*

Autoicous; in black tufts. Leaves divergent or secund, from an ovate base, lanceolate, nerved; the nerve flattened, thin, vanishing at apex, with a more or less evident lamina quite to the point. (*T. IIA.*)

SYN.—*Jungermannia rupestris* HUDS. Fl. Angl. 436, n. 22 (1762); et 2 ed. ii, 516, n. 23 (1778). WITHER. Bot. Arr. Br. Veg. ii, 698, n. 28 (1776). LIGHTF. Fl. Scot. ii, 787, n. 21 (1777). WEB. Spic. Fl. Gött. 154, n. 217 (1778). RETZ. Fl. Scand. Prod. 221 (1779). ROTH Fl. Germ. i, 485, n. 28 (1788). LAICHARD. Veg. Eur. ii, 657 (1791). LILJEBL. Svensk. Fl. 323 (1792). SCHRAD. Spic. Fl. Germ. 75 (1794). MURR. Syst. Veg. 803 (1798).

Andr. rupestris ROTH Neue Beytr. i, 234, excl. syn. (1802). WEB. f. in WEB. MOHR Archiv. i, P. I, 125, t. IV, f. 2 (1804). WAHLENB. Fl. Lapp. 306, excl. syn. Eng. B. (1812); et Fl. Suec. 2 ed. ii, 810 (1833). SWARTZ Summ. Veg. Scand. 58 (1814). Sw. in LILJEBL. Svensk. Fl. 3 ed. 569 (1816). BRID. Mant. Musc. 206 (1819). WAHLB. Fl. Gothob. 112 (1824). FRIES St. Agr. Femsjon. 29 (1825). SCHIMP. Bry. Eur. vi, Mon. 21, T. IX (1855); Syn. Musc. Eur. 667 (1869), et 2 ed. 819 (1876). SULL. Moss. Un. St. 13 (1856). HARTM. Skand. Fl. 7 ed. (1858). MILDE Bry. Siles. 257 (1869). HOBK. Syn. Br. M. 22 (1873).

Andr. Rothii WEB. MOHR Bot. Tasch. 386, t. 11, f. 7-9 (1807). HOOK. Tr. Lin. Soc. X, 393, t. 31, f. 3 (1810). Eng. Bot. t. 2162 excl. syn. Smithii (1810). SCHWÆG. Suppl. I, P. i, 43, et II, P. 1, 19, t. 106 (1811-23). SMITH Comp. Fl. Brit. 3 ed. 163 (1818). HOOK. TAYL. Musc. Brit. 2, t. 8 (1818). HARTM. Skand. Fl. 380 (1820). HOOK. Fl. Scot. P. 2, 121 (1821). GRAY Nat. Arr. Br. Pl. i, 709, n. 3 (1821). SPRENG. Syst, Veg. IV, 216 (1827). BRID. Bry. Univ. ii, 730 (1827). SWARTZ Adnot. Bot. 182 (1829); Fl. Dan. t. 2125, f. 1 (1834). HOOK. Br. Fl. ii, 5 (1833). MACKAY Fl. Hib. P. 2, 7 (1836). GAROVAG. Bry. Austr. exc. 10 (1840). ANGSTR. Disp. Musc. 23 (1842). FRIES Summ. Veg. Scand. 97 (1846). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 72 (1848). C. MUELL. Syn. Musc. i, 9 (1849). THEDEN. in Nya Bot. Not. 1849, 80. ZETTERST. Mon. Andr. Sc. 29 (1855). BERK. Handb. Br. M. 310, t. 2, f. 7 (1863). DE NOT. Epil. Briol. Ital. 748 (1869). LINDB. in Journ. Lin. Soc. xi, 460 (1870).

Jungerm. Rothii HUEB. Hepat. Germ. 304 (1834).

Autoicous; in opake rufescent or blackish fastigiate tufts. Stems ½-1 in. high, rigid, dichotomous, denuded at base. Leaves patent, curved upward at apex or falcato-secund, nerved, from an ovate base, lineal-lanceolate, smooth, entire at margin; nerve semiterete, prominent at back, vanishing at apex; lamina gradually narrowed to apex, where it consists of about five rows of cells; areolation minute and punctiform above, at base minute, subquadrate towards margin, lineal-rectangular in the middle. Perichætium but slightly exserted, three outer bracts erect, oblong with an acuminate point, nerved, inner convolute, nerveless. Capsule oblong-ovate, black-brown, pale at base.

Male infl. gemmiform, outer bracts erecto-patent, nerved only at apex, inner nerveless; paraphyses long, thickened.

Hab.—Mountain rocks, not rare. Fr. 6-7.

England—Kerris moor, Penzance (*Curnow* 1864)!! Madron and Mulfra hill, Penzance (*Ralfs*)!! Dartmoor (*Brent*)!! Lampford Tor, Great Mis Tor and Lydford, Devon (*Holmes*)!! Micklefell and Mazebeck Scars, Yorkshire (*Baker*)!! Buttermere (*Hunt*)!! Bird's crag, Abergynalwyn (*Whitehead*)!! Capel Curig (*Whalley*)!! Carned Llewellyn (*Wilson*)! *Scotland*—Loch Esk (*Dr. Hooker* 1837)! Loch Kandor (*Croall* 1856)!! Glen Callater (*Hunt*)!! Mt. Shade, Strachan (*Sim*)!! *Ireland*—Cromaglown (*Lindberg*)!!

Although Schimper refers this species to the *Jung. rupestris* of Linnæus, the plant in his herbarium is the Scandinavian *Andr. obovata*, a nerveless species, having very little in common with the plant of Dillenius which should be the true type of the species. Seeing then how much the name *rupestris* has been misapplied, it would seem to be most convenient to adopt one about which there can be no mistake, and this we find in Weber and Mohr's *A. Rothii*. The plant varies in size, and is generally of an opake black color, but sometimes it is rufous or olivaceous green, and is generally less rigid than most of our species.

Var. β. **Frigida.** (Hueben.) Lindb.

Plants more robust, flexuose, prostrate in flat tufts, black, rufescent or purplish. Leaves broader, more solid, falcato-secund. Bracts of male infl. broadly ovate.

Syn.—*Jungermannia frigida* Hueben. Hepat. Germ. 305, n. 4 (1834).

Andr. grimsulana Bruch MSS. De Not. Epil. Briol. Ital. 748 (1869). Hobk. Syn. Br. M. 22.

Andr. Rothii Var. *alpina* Bruch MSS.

Andr. Rothii Var. *grimsulana* Hook. Wils. in Lond. Journ. Bot. 1844, 537. C. Muell. Syn. Musc. i, 9.

Andr. nivalis Var. β. *frigida* Rabenh. Deutsch. Krypt. Fl. ii, P. 3, 72 (1848). Reinsch Musc. Eur. exsicc. c. fig.

Andr. rupestris Var. β. *grimsulana* Schimp. Bry. Eur. vi, Mon. 22, t. X, β. Syn. Musc. 667; et 2 ed. 819.

Andr. Rothii Var. β. *frigida*. Lindb. in lit.

Hab.—Wet rocks at considerable elevations.

Ben-mac-dhui, Braemar; on rocks in a stream near the summit on the east side (*A. Croall* 1854)!! Beamsley Fell near Ilkley, Yorkshire (*Baker* 1858)!!

This beautiful plant is larger than the typical form, and has quite the aspect of a distinct species, but the differences are too slight to afford satisfactory characters. The Scotch specimens have a fine rosy purple tint, and are much more robust than those from Yorkshire.

Var. γ. **Hamata.** LINDB. in lit.

Leaves rather lax, somewhat glossy, fuscous, green on the young shoots, strongly falcate, gradually narrowed upward from the base.

HAB.—Luggielaw, Wicklow (*Lindberg* 1873) ! ! Wet rocks at Carfury, Madron near Penzance (*Curnow* and *Marquand* 1879) ! !

This variety forms the transition between the type and var. *falcata*, agreeing with the latter in habit and falcate leaves, but with the former in the base of the leaf, and in the lamina being distinct to apex, as well as in the softer texture.

Var. δ. **Falcata.** (SCHIMP.) LINDB.

More slender, black, leaves falcato-secund, from a broadly obovate base, suddenly lanceolate-subulate; nerve flattened, vanishing at apex, lamina very narrow above, faintly eroso-emarginate just below point.

SYN.—*Lichenastrum alpinum nigricans, foliis capillaceis reflexis* DILL. Hist. Musc. 507, n. 40 t. 73, f. 40 A. and B. (1741), et Herbar.

Jungermannia surculosa, erectinscula, foliis undique imbricatis acuminatis hinc reflexis L. Fl. Suec. 336, n. 920 (1745).

Jungermannia rupestris L. Sp. Pl. 1135, n. 20 (1753); et Fl. Suec. 2 ed. 402, n. 1045, p.p. (1755); non Herbar.

Andr. falcata SCHIMP. in Herb. Hampe. Bry. Eur. vi, Mon. 24, t. XII. Syn. Musc. 669, et 2 ed. 821. MILDE Bry. Siles. 257. DE NOT. Epil. Briol. Ital. 749. HOBK. Syn. Br. M. 22. LINDB. in Journ. Lin. Soc. xi, 460.

Andr. Rothii Var. β. *papillosa* C. MUELL. Syn. Musc. i, 9.

Andr. Rothii Var. δ. *falcata* LINDB. in lit.

HAB.—Alpine rocks; not uncommon.

England—Crib-y-Ddescil, Snowdon (*Schimper* 1865) ! ! Stye-barrow crag and Scawfell Pikes (*Baker* 1867) ! ! Grasmere (*Boswell* 1876) ! ! Sheep's Tor, Shaugh Bridge and Cad Valley, Devon (*Holmes* and *George*) ! ! Cader Idris (*Pearson* 1876) ! ! Tyn-y-gros and Glyder Vach (*Wild* 1877) ! ! Llyn Elsie and Llyn Bodlyn (*George*) ! ! *Scotland*—Ben Lawers (*Braithwaite* 1862) ! ! Ben Voirlich, Loch Kandor and Bach-na-gairn (*Hunt* 1868) ! ! Cobbler, Arrochar (*George* 1879) ! !

Although at first sight, the sudden narrowing of the leaf above the base would seem to indicate that this is a good species, a careful examination of many specimens from all parts has satisfied me that it must sink to the rank of a variety, an opinion to which Prof. Lindberg has also arrived; for this character is not constant, as other leaves on the same plants will be found to approach much nearer in outline to those of *A. Rothii*, and the notching in the apical margin is equally liable to variation, being sometimes hardly perceptible, or altogether absent. The series of cells in the apical lamina appear to afford some distinctive characters, their relative proportions being 5 in *A. Rothii* and 3 in *A. falcata*, but we have only to compare young leaves from the coma with older ones from the lower part of the stem, to find that they are variable, and that it is scarcely possible to draw a line sharply between them.

Neither is the falcate direction of the leaves a character to be depended on, for Prof. Lindberg sends specimens collected by Hartman, at Varstien, in the Dovrefjeld, in which the leaves spread out equally on all sides, though with the abruptly dilated, concave base of typical *A. falcata*. We believe that Wilson until his death maintained that *A. Rothii*, *falcata* and *crassinervis* only constituted a single species. A low mammillar papillosity is also observable on the cells of the upper part of the leaf in the var. *falcata*, but this will also be distinguished in *A. Rothii*, after treatment with caustic alkali.

Sect. 2. *CHASMOCALYX*. Lindb.

Leaves and perichætial bracts alike in form, the latter patent, distinctly nerved. Capsule deeply cleft into 4, 6 or 8 valves.

5. **A. NIVALIS**. *Hooker*.

Dioicous; stem elongated, leaves laxly imbricated, papillose on both sides, falcato-secund, lanceolate, nerved to apex; perichætial bracts resembling the leaves. (*T. IIb.*)

Syn.—*Andr. nivalis* Hook. Trans. Lin. Soc. X, 395, t. 31, f. 4 (1810); Eng. Bot. t. 2334 (1811). Hook. Tay. Musc. Brit. 2, t. 8 (1818). Gray Nat. Arr. Br. Pl. i, 709, n. 4 (1821). Hook. Fl. Scot. P. 2, 121 (1821). Brid. Bry. Univ. ii, 732 (1827). Schwaeg. Suppl. III, P. I, t. 248 (1828). Hartm. Skand. Fl. 5 ed. 404 (1849). C. Muell. Syn. Musc. i, 9 (1849). Wils. Bry. Brit. 13, t. 8 (1855). Schimp. Bry. Eur. vi, Mon. 25, t. XIV (1855); Syn. Musc. 670 (1860), et 2 ed., 822 (1876). Berk. Handb. Br. M. 310 (1863). De Not. Epil. Briol. Ital. 750 (1869). Hobk. Syn. Br. M. 22 (1873).

A. nivalis Var. *β*. Zetterst. Mon. Andr. Scand. 23 (1855).

A. nivalis Var. *β*. *Zetterstedtii* Hartm. Skand. Fl. 7 ed. 400 (1858).

Jungerm. nivalis Hueben. Hep. Germ. 306 (1834).

Dioicous; in soft, blackish-green, rufescent or fuscous, widely spreading tufts. Stems 3-4 in. high, slender, elongated, reddish, decumbent at base, ascending, flexuose, dichotomously branched. Leaves patent, rather distant, secund; soft, the lower smaller, ovato-lanceolate, the upper falcato-secund, from an oblong base, gradually lanceolate, acute, densely papillose on both sides; the nerve narrow, subterete, lost in the apex, fuscous, prominent at back; areolation laxer, soft, rotundato-quadrate above, elongato-quadrate at base. Perichætial bracts divergent, precisely resembling the leaves; capsule a little exserted, oblong, cleft to base into 6, or more rarely 4, narrow valves. Calyptra very small, conical.

Male plants in distinct tufts, the infl. lateral by innovation, distinct, gemmiform; bracts numerous, ovato-lanceolate, inner roundish, acuminate nerveless; antheridia 4-6, paraphyses numerous, longer.

HAB.—Higher mountains of Scotland, on dripping rocks. Fr. 7-8.

Ben Nevis (*Hooker* and *Borrer* 1808)! Ben Cruachan, Argyleshire (*Borrer* 1810)! Ben Macdhui and Cairngorm (*Croall*)!!

This fine species appears to attain its fullest development on the Grampian range; although it is found in Scandinavia, and on the higher peaks of the Pyrenees, Switzerland, the Tyrol, and eastward to Salzburg and Carinthia, we have not seen any specimens to equal those of native growth.

Var. β. **Fuscescens.** HOOK.

Stems more flexuose and flaccid, with strongly falcate leaves of a brown color.

SYN.—*A. nivalis* β. *fuscescens* HOOK. in Trans. Lin. Soc. X, 395 (1810).

A. nivalis HOOK. ZETTERST. Mon. Andr. Scand. 23 (1855). HARTM. Skand. Fl. 7 ed. 400 (1858).

HAB.—With the typical form on Ben Nevis and Ben Macdhui (*Hooker*)!!

This form is described as the type by Zetterstedt, because as he says, it is the common form in Scandinavia and assumed to be therefore more typical. There does not seem any reason to disturb Hooker's original arrangement, although it is certain the variety more frequently bears fruit, while the type is richer in male inflorescence.

TAB. I.

A. *Andreæa petrophila.*

α. typical form (Ben Lawers, *Braithwaite*). β. Var. *homomalla* (Braemar, *Hunt*). γ. Var. *acuminata* (Ben Nevis, *George*). δ. Var. *flaccida* (Braemar, *Hunt*). ε. Var. *sylvicola* (Ben Macdhui, *Hunt*). ζ. Var. *gracilis* (Loch-na-Gar, *Sim*). η. Var. *alpestris* (Braemar, *Croall*). ϑ. Var. *sparsifolia* (Ben More, *George*).

B. *Andreæa alpina.*

α. typical form (Ennerdale, *Baker*). γ. Var. *flavicans* (Ben Nevis, *Hooker*).

C. *Andreæa crassinervis* (Hebden bridge, *Hunt*).

TAB. II.

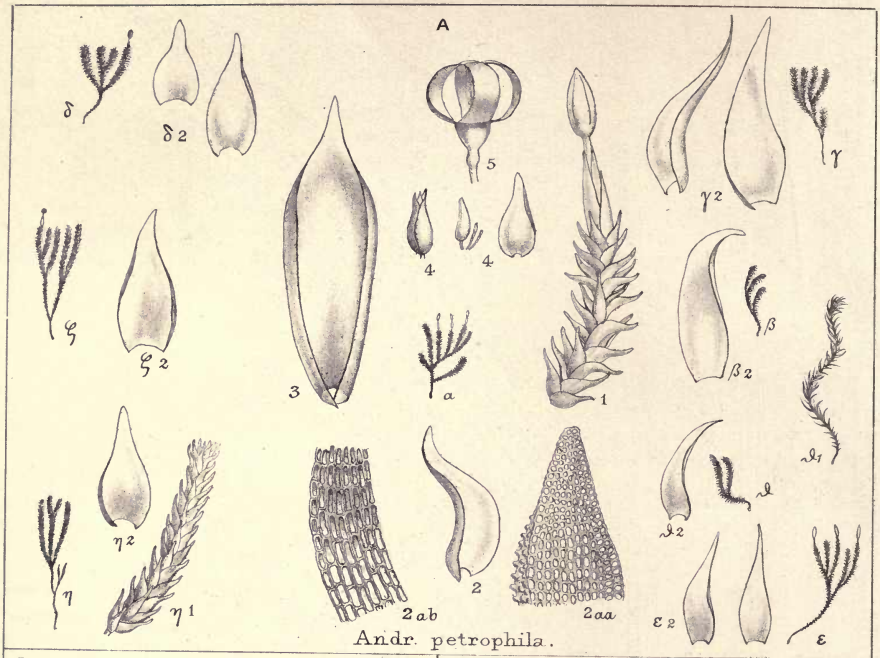
A. *Andreæa Rothii.*

α. typical form (Dartmoor, *Holmes*). β. Var. *frigida* (Ben Macdhui, *Croall*). γ. Var. *hamata* (Luggielaw, *Lindberg*). δ. Var. *falcata* (Snowdon, *Schimper*).

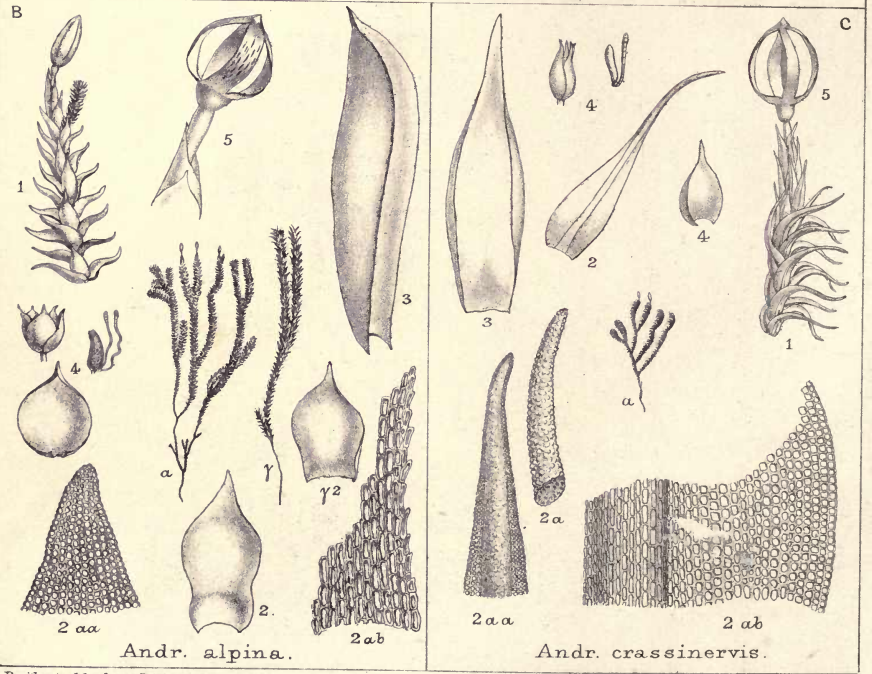
B. *Andreæa nivalis.*

α. typical form ♂ (Ben Macdhui, *Hunt*). β. Var. *fuscescens* ♀ (Ben Nevis, *George*).

1. Branch in a moist state. 2. Leaf × 25. 2a. Apex of leaf dry. 2aa. Areolation of apex moist. 2ab. Ditto of base × 180. 2x. Transverse section of leaf. 3. Perichætial bract. 4. Male inflorescence with bract, antheridium and paraphyses. 5. Capsule dry. 6. Calyptra.



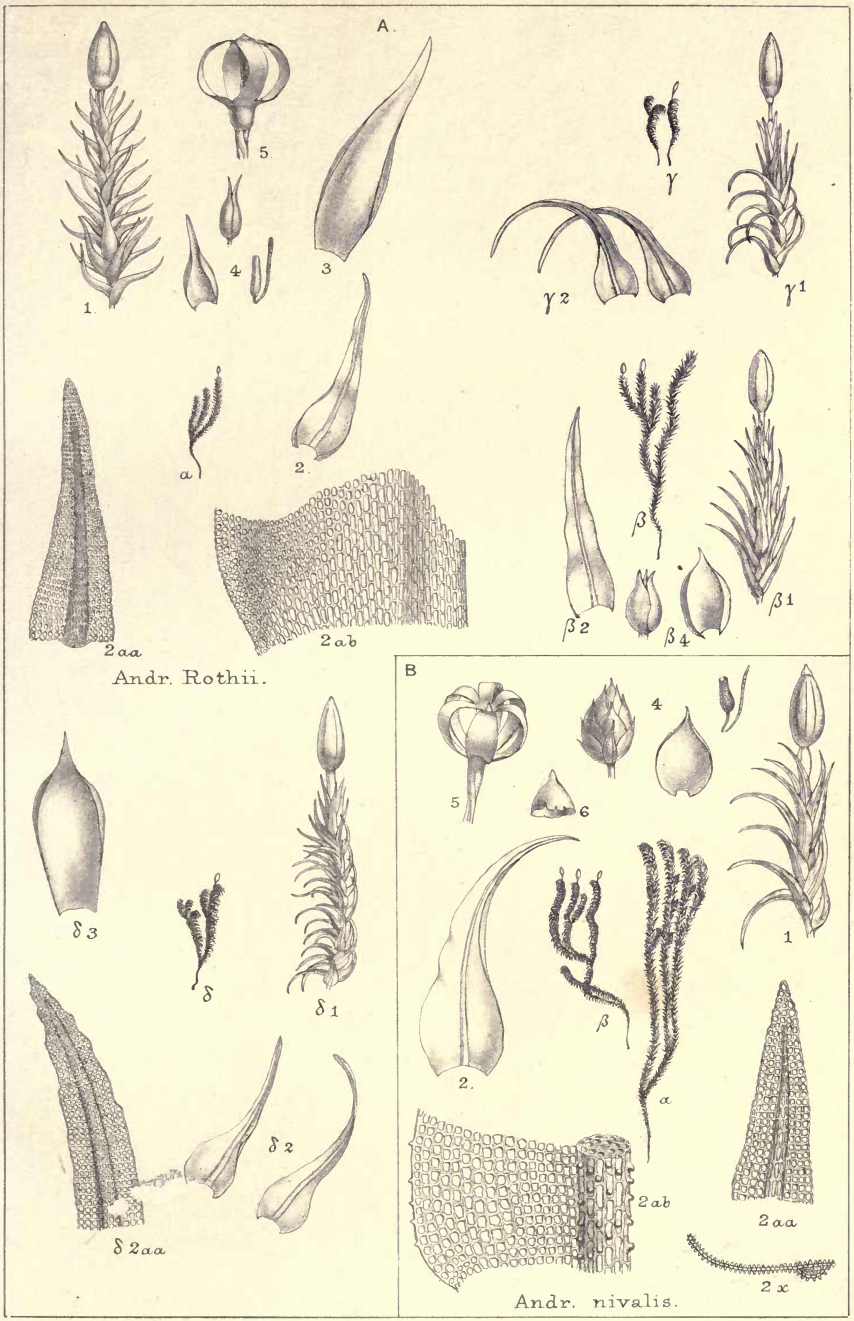
Andr. petrophila.



Andr. alpina. Andr. crassinervis.

R. Braithwaite del. ad nat. D. Blair lith.

West Newman & Co. imp.


A.
1.
5.
4
3
γ
γ2
γ1
2aa
a
2.
2ab
β
β2
β4
β1
Andr. Rothii.
B
5
6
4
1
δ3
δ
δ1
2.
β
α
2ab
2aa
δ2
δ2aa
2x
Andr. nivalis.

BUXBAUMIACEÆ.

JULY 1ST, 1880.

BUXBAUMIA. HALL.

1. **B. aphylla.** L.

2. — **indusiata.** BRID.

Sect. 2. *STEGOCARPI.*

Capsule dehiscing transversely by a lid; or in a few lower forms the lid is absent, and the capsule ruptures only by decay of its walls.

Div. 1. ANARTHRODONTEI.

Peristome consisting of solid teeth not transversely jointed, often attached at the apex to the discoidal dilated extremity of the columella; sometimes ciliiform; very rarely none.

Fam. 2. BUXBAUMIACEÆ.

Plants very small, stemless, growing on the ground or on rotten wood. Leaves obsolete. Capsules large, oblique, flattened, on stout pedicels; calyptra minute conical; peristome of one or several series of linear teeth; endostome a 32-plicate membrane in form of a twisted truncate cone; spores very small.

The extremely curious plant on which the solitary genus in this family is founded, was first discovered by Buxbaum in 1712, near Astracan, on the banks of the Volga, and he says, "I wished to follow the example of Marchanti, and make it into a new genus and name it after my father, but called to mind the fox, who was derided by the others, because he begged the grapes, not for himself, but for his sick mother."

It was for some time regarded as a fungus; but Dillenius correctly referred it to the mosses, and indeed terms it *regina muscorum;* Schmidel submitted it to a minute investigation and published the result in 1758, in a most beautifully illustrated Dissertation, and Linnæus also treated on it in several places; in our own day Zukal has gathered together much of what is known on the subject in an admirable paper in Verh. k. k. zool. bot. Gesells. Wien xiii, p. 1149 (1863).

The sporadic character of its distribution and the scanty numbers in which it is found have invested it with rarity, and its discovery is generally hailed with acclamation by collectors, while its peculiar structure will always render it an object of interest to the bryologist.

The first appearance of *Buxbaumia aphylla* is manifested by the surface of the ground being colored in patches of a peculiar greenish

black, this is a felted web of minute branched filaments of protonema, from which young plants bud off as in other mosses; these are at first globose and extremely minute. The almost invisible leaves are rather to be looked upon as perichætial bracts, and are peculiar in the flagelliform prolongations of the marginal cells, which give them a lacerated appearance, and long before the calyptra is cast off they become brown and dead. The reason of this is explained by Zukal thus:—"Their activity probably consists in the transmission of moisture, and along with the adventitious radicles they first form a protection to the young archegonium, and then in the act of impregnation serve as a sponge, to take up fluid swarming with antherozoids, and convey them to the waiting archegonia, this function ended, they wither and die."

Taking a single plant, we observe at the base a bulb-like swelling covered with a close felt of proembryo filaments and minute leaves, this by vertical section we find is a cup-like sheath, embracing the base of the seta, the outer cells of which are large, quadrate, with thick walls and colorless contents, and become the cuticle of the seta, the cells internal to this layer being long and thin walled, constitute the bundle of vascular cells forming the centre of the seta, while the cup-like sheath is all we find to represent the parenchyma of the stem. In the free seta the first two elements are more fully developed, the outer cuticular cells being still further thickened into warts. Where the seta joins the capsule an elegant neck is formed, through the centre of which the vascular bundle is continued as the pedicel of the spore sac, and then enlarges into the columella and passes on to the apex of the operculum. Around the columella is the spore sac composed of three cell-layers, the cavity between it and the capsular wall being traversed by numerous jointed confervoid filaments. A transverse section through the lid, before maturity, shows us a circle of large triangular cells, the two lateral sides being equal, and the shorter base turned alternately inward and outward, thus forming a wavy zigzag round the central bundle of vascular cells. In course of growth the short bases become entirely resorbed, while the lateral sides of the triangles grow together and become thickened into a membrane, and their outward angles further strengthened by a stout ridge of cellulose. It thus forms an enduring, rigid, tubular, tent-like endostome, the function of which is thus remarked on by Zukal:—"In many mosses the peristome only serves to prevent the spores passing out of the capsule in unfavorable weather; if the spores require warm, dry air as a necessary condition for germination, then the peristome is so adapted that in wet, rainy weather it completely closes the mouth, and on the contrary, if moisture be the condition needed, then in dry weather the peristome closes the mouth of the capsule. The spores of many mosses are first set free by the falling in pieces of the capsule by decay, and until this occurs they must be

ripening; in the cleistocarpous mosses this is provided for by the absence of a lid, and in the Polytrichaceæ by the discoidally expanded summit of the columella closing the mouth. In *Buxbaumia* the lid remains long attached to the mouth, while it is firmly joined to the columella by the vascular bundle running through it, and only becomes loosened by the rotting of the fruit; the endostome also forms a high, firm, conical membrane, with a small aperture at the apex, formed by the falling away of the vascular bundle; through this narrow opening, however, the spores cannot escape, even if the erect position of the fruit would allow it, and thus they are forced to remain in the capsule. In time, the upper half of the capsule separates at the lateral seam,—like a bivalve fruit, as it was described by old authors,—and thus a free exit is made for the spores."

I follow C. Müller, Zukal, and Lindberg in excluding *Webera* Ehrh. (*Diphyscium* Mohr.) from this family, for the two genera have nothing in common but the external form of the capsule, while the highly developed seta, absence of stem and degraded leaves of *Buxbaumia* are totally opposed to the absence of a pedicel, distinct stem, and highly-developed leaves seen in *Webera*.

Besides the European species of *Buxbaumia*, the only others recorded are *B. Javanica* C. Muell. and *B. Tasmanica* Mitt., the former very close to *B. aphylla*, the latter equally near to *B. indusiata*, and probably not specifically distinct from them.

By the depressed asymmetric capsule, so unusual in mosses, we have some indications of affinity with the exotic genus *Dawsonia*, and a further snpport to the position of the family among the *Polytrichoideæ*, though it must be admitted that the cilia of the perîstome of *Buxbaumia* do present a few transverse articulations.

BUXBAUMIA. Haller.

(Enum. Stirp. Helv. i, p. 10 (1742).)

Plants very small, scattered. Leaves extremely minute, broadly ovate or oblong, coarsely serrated, laxly areolate with oblongo-hexagonal echlorophyllose cells, or palmato-laciniate, the laciniæ and basal cells becoming altered by age into long filaments, and finally into dense radicular tomentum. Inflorescence dioicous. Male plants very minute, few-leaved, the bracts not laciniate, antheridia one or two, subglobose, with few paraphyses. Female plants presenting 10-12 perichætial bracts which after impregnation develop cilia. Calyptra very small conico-cylindric, generally cleft at the side; capsule on a thick verrucose seta, with a short, erect neck, oblique, ventricose, ovate, depressed above, with a conico-cylindric operculum.

Cuticle at margin of the mouth of capsule splitting into about 16 scale-like fragments which roll back and reveal the pseud-annulus, composed of several layers of cells, and forming the thickened mouth of capsule; peristome rudimentary and adhering to the pseud-annulus, or consisting of one or several rows of irregular filamentous teeth; endostome a conical tubular 32-plicate membrane, thickened along the angles of the folds, and slightly twisted to the right. Spores very small, spherical.

Small as this genus is, the remarkable variation in the peristome has led to its division into two sections—*Eubuxbaumia* for *B. aphylla*, *Polyodon* for *B. indusiata*—the difference in the form and texture of the capsules also affording an additional distinction.

The actual presence of leaves was first noticed by Robert Brown (Linn. Trans. xii, p. 583).

Clavis to the Species.

Capsule depressed on upper surface, firm, with a thickened margin; peristome one row of short imperfect cilia.

B. aphylla.

Capsule ovate-oblong, thin, the cuticle loose and splitting up beneath; peristome of four rows of cilia.

B. indusiata.

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1. BUXBAUMIA APHYLLA. *L.*

Capsule pachydermous, glossy, depressed on the upper surface, with a thickened margin. Peristome a single row of short, imperfect teeth adhering to the inside of the margin of mouth (T. III A).

Syn.—*Muscus capillaceus aphyllos, capitulo crasso bivalvi* Buxb. Pl. min. cogn. cent. II, 8, tab. 4, f. 2 (1728). Dill. Hist. musc. 477, n. 5, et 554, tab. 68, f. 5 (1741), et Herb.

Buxbaumia Hall. Enum. stirp. Helv. i, 10 (1742).

Hippopodium Fabric. Prim. fl. butisbac. 31 (1743). Ehrh. Phytoph. n. 10; Beitr. IV, 146 (1789).

Buxb. aphylla L. Diss. Buxb. § II, 10, et § VII, 15 (1757); et Amœn. acad. V, 83 et 90 (1760). Oeder Fl. Dan. t. 44 (1761), et t. 2752, fig. 1. Web. Spic. Fl. Gött. 130 (1778). Retz. Fl. Scand. Pr. n. 1188 (1779). Ehrh. Hann. Mag. 1780, p. 235. L. Fil. Meth. Musc. 362 (1781). Hedw. Fund. musc. P. II, 96, tab 3, f. 10 et t. 9, f. 52 (1782); Sp. musc. 166 (1801). Vill. Pl. Dauph. iii, 919 (1786). Timm Fl. Megap. n. 858 (1788). Roth Fl. Germ. i, 466 (1788); et iii, P. I, 343 (1800). Jacq. Collect. iii, 213 (1790). Hoffm. Deutschl. Fl. ii, 21 (1795). Sturm Deutsch. Fl. ii, tab. 3 (1798). Swartz Musc. Suec. 74 (1799). Brid. Musc. rec. ii, P. III, 147 (1803); Sp. musc. III, 114 (1806); Mant musc. 123 (1819). Turn. Musc. Hib. 104 (1804). Lam. et Cand. Fl. fr. 3 ed. i, 513 (1805); et Syn. Fl. Gall. 106. Schultz Fl. Starg. 255 (1806); Eng. Bot. t. 1596 (1806). Web. Mohr Bot. Tasch. 381 (1807) Voit Musc. Herb. 126 (1812). Wahl. Fl. Lap. 350 (1812). Schwaeg. Suppl. I, P. II, 26 (1816). Hook. Fl. Lond. n. s. I, T. 23 (1815). Mart. Fl. crypt. Erl. 84 (1817). Hook. Tay. Musc. brit. 84, T. 22 (1818). Hook. Fl. Scot. P. 2, 139 (1821); Brit. Fl. ii, 68 (1833). Grev. in Mem. Wern. Soc. iii, 442 (1821); et V, 79, Pl. III, fig. 13-23 (1824). Funck Moostasch. 38, t. 24 (1821). Hueb. Bry. germ. 539 (1833). Br. Schimp. Mem. Soc. mus. Strasb. ii, Mon. 4, t. 1 (1835); Bry. Eur. iv, Mon. 5, t. 1, et Suppl. t. 1; Syn. Musc. 453 (1860); et 2 ed.

549 (1876). RABEN. Deutsch. Krypt.-Fl. ii, P. III, 240 (1848). C. MUELL. Syn. i, 151 (1848); et Deutsch. moose 144 (1853). WILS. Bry. brit. 199, T. 22 (1855). JENS. Bry. dan. 59 (1856). KLINGGR. Crypt. Preus. 15 (1858). HARTM. Skand Fl. 9 ed. ii, 45 (1864). LIND. in Not. ur Sällsk. Fn. et Fl. fenn. ix, 155 (1867). BERK. Hand. br. m. 215, t. 19, fig. 6 (1869). DE NOT. Ep. Briol. ital. 346 (1869). MILDE Bry. siles. 255 (1869). HOBK. Syn. Br. M. 99 (1873).

Buxb. caulescens SCHMID. Diss. Buxb. 25, tab. 1 (1758). SCHRANK Baiers. Fl. ii, 485 (1789).

Buxb. caulescens aphylla HALL. Hist. stirp. Helv. iii, 25 (1768).

Saccophorus aphyllus P. BEAUV. Prodr. 30 (1805).

Hippopodium aphyllum RÖHL. Deutschl. Fl. 2 ed. iii, 120 (1813).

Buxb. curiosa GRAY Nat. Arr. Br. pl. i, 750 (1821).

Buxb. vulgaris BRID. Bry. univ. i, 329 (1826).

Stem none. Vaginula thick, covered with fuscous radicles. Bracts minute, brownish, the lower ovate, deeply toothed, the upper broader, fimbriato-ciliate, areolation lax, the cells 5-6 angled. Seta rigid, erect, straight, ½ to 1 in. high, deep purple, very scabrous. Capsule with a short neck, inclined and subhorizontal, depressed, semiovate and somewhat boat-shaped above, ventricose below, smooth, greenish brown, the cuticle thicker, glossy, and closely adherent, rolling back at the mouth in about 16 segments, and forming a coroniform border; operculum short, conoid, obtuse, falling with the columella attached; peristome indistinct, united to the pseud-annulus or abortive. Spores very small.

HAB.—On the earth or on decayed wood, especially in fir-woods. Fr. 4-7.

Engl.—Sprowston, Norfolk (*Hooker*, Dec., 1806)! Sawley moor, near Ripon, Yorkshire (*McIver* 1845)! Ogden Clough, Tintwistle, Cheshire (*Scholefield* 1867)!! Near Virginia Water, hedge bank, on mud taken from the ditch below (*Prof. Lawson*, Apr., 1868)!!

Scot.—Rosslin (*Maughan* 1808). Aberdeen (*Jackson* 1809). Hill of Dungloe, Kinross, and Cleish Hills (*Greville*). Waddenhope rigg, near Peebles (*Stewart* 1818). Georgetown hill, Fife (*Arnott*). Campsie Glen, Glasgow, and Ben Ledi (*Lyon* 1841)! Sidlaw hills (*Gardiner* 1844)!! Ochil hills. Bowling Bay. Sinnaboth, Towie, near Aberdeen (*Coutts* 1860). Glen Prosen (*Fergusson* 1867). Brockhole's plantations, near the Tweed (*Jerdon*), and barren places on the Bizzle (*Boyd* 1867). Clough-na-ben and Sculty hill, Banchory (*Sim* 1869)!!

Irel.—Purple mountain, Killarney (*Wade* in R. Dubl. Soc. Trans. iv.—1804), not found since.

This strange plant has an annoying habit of disappearing from the stations it occupies, probably due to some change in the constituents of the substratum on which it is produced, and thus we can never rely upon finding it a second time in the same locality.

2. BUXBAUMIA INDUSIATA. *Brid.*

Capsule leptodermous, not glossy, not depressed nor margined. Peristome of four series of solid, slender, papillose teeth; each series increasing in length. (T. III B).

SYN.—*Buxbaumia viridis* BRID. in litt. LINDB. Musc. Scand. 13 (1880).

Buxb. aphylla Var. *β. viridis* MOUG. in DE CAN. Fl. fr. 3 ed. V, 227 (1815). MOUG. NEST. Stirp. Cr. Vog. R. n. 720 (1823). MYRIN in W. Ak. Handl. 1831, p. 253.

Buxb. indusiata Brid. Br. univ. i, 331 (1826); et ii, Suppl. 741, t. 2, fig. 1-8 (1827). Wallr. Fl. cryp. Germ. i, 116 (1831). Hartm. Sk. Fl. 2 ed. Hueben. Musc. germ. 540 (1833). Br. Schimp. in Mem. Soc. Mus. Strasb. ii, Mon. p. 4, t. 2 (1835); Bry. Eur. iv, Mon. 6, t. 2 et suppl. t. 1; Syn. Musc. 454 (1860) et 2 ed. 550 (1876). De Not. Syll. musc. Ital. 146 (1838); Epil. Briol. Ital. 347 (1869). C. Muell. Syn. i, 151 (1848) et Deutsch. Moos. 147 (1853). Raben. Deutsch. Krypt. Fl. ii, P. III, 240 (1848) et Krypt. Fl. Sachs. i, 522 (1863). Jensen Bry. dan. 59, t. 8, f. 41 (1856). Klinggr. Crypt. Preuss. 15 (1858). Lange Fl. dan. t. 2752, f. 2. Hartm. Sk. Fl. 9 ed. ii, p. 45 (1854). Lindb. in Not. ur Sällsk. Fn. et Fl. fenn. ix, 156 (1867). Milde Bry. Siles. 256 (1869). Hobk. Syn. Br. M. p. 99 (1873).

Buxb. aphylla Schwægr in L. Sp. Pl. 5 ed. V, P. II, fasc. 1, p. 24, p. p. (1830).

B. aphylla Var. *β. indusiata* Wahlenb. Fl. suec. 2 ed. ii, p. 760 (1833). Hampe in Reg. bot. Zeit. 1837, p. 279.

Stem none. Vaginula thick, covered with rufescent tomentum. Bracts minute, rufescent, ovate or oblongate, obtuse, the lower obsoletely crenulate at margin, the upper fimbriato-ciliate, areolation lax, 5-6 angled. Seta rigid, erect or flexuose, shorter, rufo-fuscous, less scabrous; capsule suberect, ventricose, ovate-oblong, pale greyish-green, the cuticle thin, loose, after the fall of the operculum splitting up beneath and rolling back towards the sides; operculum larger, more conic, obtuse, peristome in four rows, teeth subtriquetro-linear, the outermost very short, the others gradually increasing in length, more or less evidently articulated, fuscescent. Spores larger, greenish.

Hab. On rotten branches in pine woods. 6-7.

Pannanich, near Ballater, (*Cruickshank* 1847). North face of Craigendinnie hill, near Aboyne, at 500 ft. (*Dickie* and *Roy*, June, 1867). Reported also from Rosshire.

Lindberg suspects this species to be synoicous, as he has frequently found empty antheridia among the vaginular tomentum, but never male plants.

Tab. III.

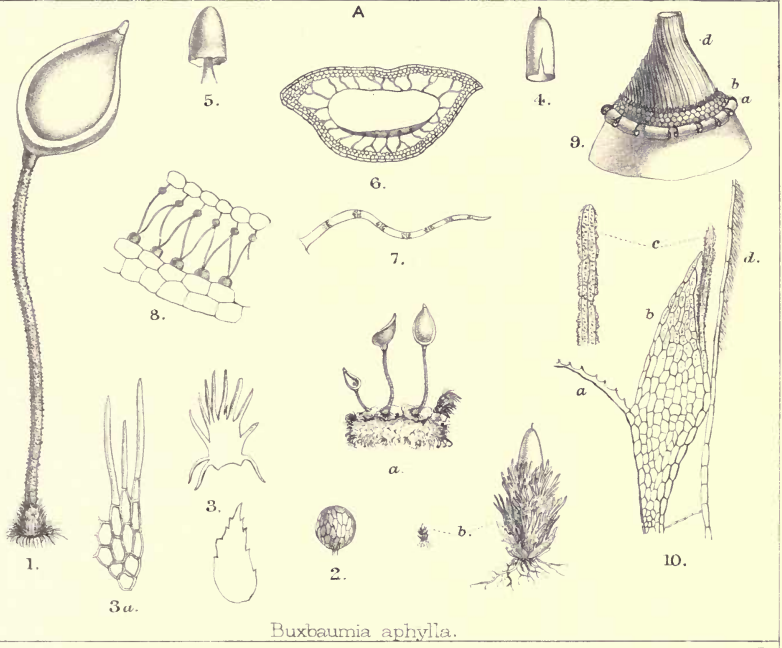
A. *Buxbaumia aphylla* (Virginia Water, *Prof. Lawson*).

B. *Buxbaumia indusiata* (Craigendinnie, *Prof. Dickie*).

a. Perfect plants. b. Young plant, nat. size and magnified.

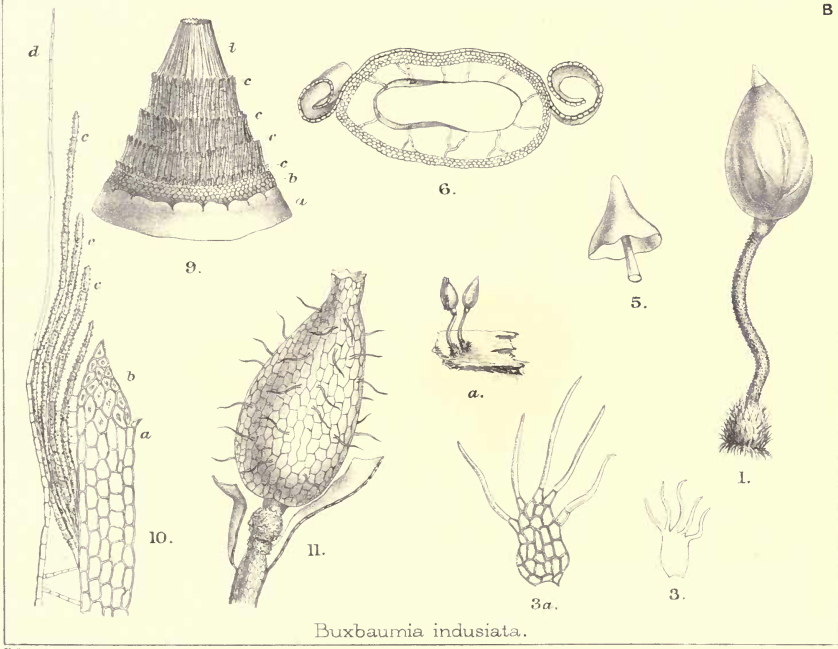
1. Plant magnified. 2. Antheridium. 3. Perichætial bracts. 3a. Same, more magnified, showing the areolation. 4. Calyptra. 5. Operculum and part of columella. 6. Transverse section through the middle of capsule. 7. Filament connecting the spore-sac with the lining of the capsule. 8. Transverse section through the operculum and endostome, showing the plicæ and thickened ridges of the latter. 9. Mouth of capsule after removal of operculum. 10. Vertical section of part of same. a. Cuticular stratum. b. Pseud-annulus. c. Cilia of peristome. d. Tubular endostome. 11. Pedicellate spore-sac, the walls of capsule dissected away.

A



Buxbaumia aphylla.

B



Buxbaumia indusiata.

R. Braithwaite del. ad nat. D. Blair lith. Mintern Bros imp.

GEORGIACEÆ.

GEORGIA. Ehrh.

1. **G. pellucida** (L). Rabenh.
2. — **Brownii** (Dicks). C. Muell.

Fam. 3. GEORGIACEÆ.

Plants cæspitose or very small and gregarious; the leaves in 3-5 rows, smooth, ovate, or lanceolate with a thin nerve, areolation hexagono-rotundate, sparingly chlorophyllose. Inflorescence gemmiform. Calyptra mitriform, lobed at base, longitudinally plicate, covering most of capsule, which is erect, cylindric or oval, regular, smooth. Annulus none. Operculum conical; peristome of 4 triquetro-pyramidal teeth, composed externally of pachydermous, elongato-prosenchymatous, colored cells, internally of lax hyaline cells; rarely wanting. Inhabiting damp, shady rocks, rotten trunks of trees, or turfy soil.

Mr. Mitten constitutes of this family his section Elasmodontes, but the teeth are not lamellar, for the peristome truly consists of a conical mass, composed of the whole parenchyma within the operculum, or the upper end of the columella united to the teeth, which splits into four triangular pyramids formed of elongated incrassate cells.

Ehrhart founded the genus *Georgia* in honor of our George the 3rd (to whom also Hedwig dedicated his great work "Descr. et adumb. Musc. frond."), and he says in his Beiträge iii, p. 126, "Hedwig's *Tetraphis* is no other than my *Georgia*. If botanists deserve a memorial of their names in botany, equally worthy of the honor are great patrons of the science, as my friend Hedwig must admit. I propose to give to my new genera the names of such distinguished men, and thus the present bears the name of one of the greatest supporters of botany." Ehrhart's *Catharinea*, *Swartzia*, *Weissia* and *Webera* must equally be retained, instead of the more modern names which have displaced them, and of the same names subsequently applied by other botanists to very different genera. *Tetrodontium* was established by Schwaegrichen, no doubt from its different habit, but it possesses no essential character of sufficient importance to separate it from *Georgia*. Berggren, in an admirable paper, "*Studier öfver Mossornas byggnad och utveckling*. 2, *Tetraphideæ*," in Act. Univ. Lund. vii, n. 8 (1870), points out that the frondiform leaves also occur in *G. pellucida*, developed from gemmules, but they appear in the protonemal stage preceding the ordinary state of the plant, and disappear with its further development; a sketch of one of these spathulate fronds, reduced from Berggren's figure, is given at T. IV, A. Fig. 9.

The genus *Georgia* appears to touch various widely different families without having much relation with any of them, thus the sulcate calyptra forcibly reminds us of *Zygodon* and *Orthotrichum*, while the areolation of the leaves is mnioid, and again the peristome is quite peculiar in the structure of the teeth; we may thus notice that a genus is not to be characterised by any single organ, but rather by the sum of the differences found in all its parts.

The second genus in this small but natural family of 4 species is the monotypic *Calomnium* from New Zealand, which, although gymnostomous, and with a dimidiate calyptra, agrees so closely in habit and structure of leaf with our *Georgia pellucida*, that its place in this family ought to be at once apparent, yet Lindberg appears to be the only author who has noticed its true affinity; see his remarks in Act. Soc. scient. fenn. X, p. 240 (1872).

GEORGIA. Ehrhart.

(Hannov. Mag. 1780, p. 932).

Plants cæspitose, tall, erect, or very small with long radical linear leaves or flagelliform leafy branches. Lower leaves small, upper much larger, ovato-lanceolate, areolation hexagono-rotundate, at base laxer and linear-rectangular. Calyptra mitriform, plicate, sulcate, covering greater part of capsule. Capsule cylindraceous or oval, leptodermous, on a long pedicel; operculum conical; peristome arising below the mouth, teeth 4, lanceolate in outline, striate at back, rufous. Spores smooth, green or yellow. Growing on the ground, on rotten wood, or on sandstone rocks.

Sect. 1. *TETRAPHIS.* Hedw.

Plants taller, slender, cæspitose, the leaves increasing in length upwards; primordial frondiform leaves, present only in the early state of the plant, then vanishing. Capsule cylindric.

1. **GEORGIA PELLUCIDA** (*L.*) *Rabenh.*

Autoicous; cauline leaves in 3 or 5 rows, ovato-lanceolate, acute, nerve vanishing below apex, capsule cylindric, on a straight, smooth seta. (T. IV A).

Syn.—*Mnium minus non ramosum angustioribus et pellucidis foliis* Dill. in Ray Syn. st. brit. 3 ed. 78 (1724).

Mnium Serpylli foliis tenuibus pellucidis Dill. Hist. Musc. 232, n. 2, t. 31, f. 2, excl. A (1741); et Herbar.

Mnium pellucidum L. Sp. pl. ii, 1109, n. 1 (1753); et Fl. suec. 968. Huds. Fl. angl. 402 (1762). Hall. Hist. st. Helv. iii, 56, t. 45, f. 8 (1768). Weiss Crypt. Gött. 162 (1770). Neck. Meth. musc. 233 (1771). With. Bot. arr. Br. Veg. ii, 663, 1 (1776). Lightf. Fl. Scot. ii, 705 (1777). L. Fil. Meth. musc. 363 (1781). Relh. Fl. cant. 398 (1785). Schmid. Ic. pl. rar. 2 ed. i, 13, t. 3 (1793). Hull. Br. Fl. 249 (1799).

Bryum diaphanum Web. Spic. Fl. gött. 121 (1778). Vill. Pl. Dauph. iii, 873 (1789).

Georgia Mnemosynum Ehrh. in Hann. Mag. 1780, 932; et Beitr. i, 188 (1787). C. Muell. Syn. musc. i, 182 (1849).

Tetraphis pellucida Hedw. Fund. musc. ii, 88, t. vii, f. 32 (1782); Sp. musc. 45, t. 7, f. 1 a—f (1801). Roth. Fl. Germ. tent. i, 454, et iii, P. I, 132 (1788). Brid. musc. rec. ii, P. I, 48 (1792); Sp. musc. I, 83 (1806); Mant. musc. 26 (1819); Bry. univ. i, 134 (1826). Sibth. Fl. Oxon. 275 (1794). Röhl. Deutsch. Fl. 41 (1794); Moosg. Deuts. 87 (1800); Ann. Wett. Ges. ii, 79. Hoffm. Deutsch. Fl. ii, 30 (1796). Swartz Musc.

suec. 21 (1798). SMITH Eng. Bot. t. 1020 (1802); Fl. brit. iii, 1179 (1804). STURM Deutsch. Fl. ii, 2 (1803). LA MRK. CAND. Fl. Fr. i. 449 (1805). Fl. Dan. t. 300 et t. 1412. P. BEAUV. Prodr. 90 (1805). SCHULTZ Fl. starg. 281 (1806), WEB. MOHR Bot. Tasch. 93 (1807). SCHKUHR Deutsch. moos. 52, t. 13 (1810). MOUG. and NEST. St. Crypt. n. 14. SCHWAEG. Suppl. I, P. 1, 39 (1811); et III, P. 1, t. 232 (1828). WAHLEN. Fl. lapp. 305 (1812); Fl. carpat. 334 (1814). HOOK. Fl. Lond. n. s. t. 90 (1816); Fl. Scot. P. 2, 124 (1821); Br. Fl. ii, 14 (1833). SAVI Bot. etrusc. iii, 39 (1818). HOOK. TAY. Musc. br. 16, t. 8 (1818). GRAY Nat. arr. Br. Pl. 717 (1821). HARTM. Sk. Fl. HUEB. Musc. Germ. 72 (1833). MACKAY Fl. Hib. P. 2, 12 (1836). DE NOT. Syll. musc. 262 (1838); Epil. Briol. Ital. 725 (1869). FIOR. MAZ. Bry. rom. 2 ed. 5 (1841), SCHIMP. Bry. Eur. iii, mon. 6, t. 1 (1843); Syn. musc. 282 (1860); et 2 ed. 349 (1876). WILS. Bry. brit. 196, t. 8 (1855). JENS. Bry. dan. t. 3, f. 16 (1856). SULL. Moss. Un. St. 30 (1856). BERK. Handb. br. m. 216, Pl. 19, f. 8 (1863). MILDE Bry. Siles. 244 (1869). HOBK. Syn. br. m. 98 (1873).

Bryum pellucidum ABBOT Fl. bedf. 237 (1798).

Tetraphis oblonga TURN. Musc. hib. 12 (1804).

Tetr. cylindrica VOIT Musc. herbip. 17 (1812). FUNCK Moostasch. 9, t. 6 (1821).

Georgia pellucida RABENH. Deutsch. Krypt. Fl. ii, P. 3, 231 (1848). SPRUCE in Tr. Bot. Soc. Edinb. iii, 153 (1849); et in Ann. Mag. N. hist. 2 ser. iii, 359 (1849). LINDB. in Ofv. V. Ak. Förh. XX, 399 (1863), et in Bot. ur Sällsk. Fn. et Fl. fenn. IX, 150 (1867).

Autoicous. Plants rather densely cæspitose, erect; bright green above, reddish brown below. Stems of two kinds, 1. fertile,—having leaves in 3 ranks, crowded, ovato-lanceolate, becoming 5 ranked and enlarging into a coma; 2. gonidiiferous,—with leaves in 3 ranks, and more distant, two in nearly opposite rows, the third smaller and anterior, the gemmæ lentiform, in a cuplike involucre of 4-5 reniform leaves, terminating the stem.

Fertile stem flexuose, ½-1 in. high, erect, simple or dichotomous, radiculose at base, pale red. Lower leaves very small, remote, erect, appressed, broadly lanceolate, rufous; upper much larger, ovato-lanceolate, patent, entire, nerve vanishing below the point; perichætial bracts sheathing, lanceolate, elongated, rather obtuse. Cells roundish hexagonal above, elongated rectangular at base. Capsule erect, on a straight, smooth, purple pedicel, elongated, cylindric, pale brown, with the mouth red; calyptra reaching to middle of capsule, whitish, rust colored at apex, mitriform, sublacerate at base, irregularly plicate, with about 8 or 9 ridges, which run out into serrate crests at apex; annulus none; operculum thin, conical, straight or oblique; peristome of 4 erect, brown, pyramidal teeth, connivent when moist, triquetrous, rigid, not articulated, but longitudinally striate at back; columella slender, cylindric; spores very small, smooth, green. Male inflorescence at the apex of special shoots, which arise in pairs from a sterile female inflorescence; bracts 6-10, ovato-lanceolate, nerved.

Gemmiferous stem with lax leaves, very small and distant below, those about the middle being the largest, obovate, apiculate, with the nerve vanishing below apex, then decreasing in size toward the

top; areolation uniform, hexagonal; cup of 3-4 obcordate, obsoletely nerved bracts, enclosing many flattened lenticular, stalked gemmæ, intermixed with paraphyses, these gemmæ are altered antheridia, as the cups often arise in pairs just as the perfect males do. Occasionally also a gemmiferous shoot may be found growing from a female inflorescence.

HAB.—Damp, shady rocks, rotten stumps of trees, decayed palings, and on turfy banks on heaths, not uncommon. Fr. 7-9. Plentiful about Killarney, but otherwise rather scarce in Ireland, as it also is in Cornwall.

This beautiful moss is widely distributed, and in North America besides the ordinary form, a variety (*curvata Lindb.*) is common, having a narrower, curved capsule. The leaves vary much in size, as well as in density of arrangement, and we have seen stems of the gemmiferous plant, having them almost circular. It is also not uncommon to find gemmæ, which have dropped from the cups, entangled among the leaves and attached to the stem by radicles they have thrown out. The second species—*G. geniculata* GIRGENS.—is a native of Japan and N. West America, and differs from the European species chiefly in the seta, which is suddenly bent about the middle to an obtuse angle, and roughly tuberculate above the bend.

Sect. 2. *TETRODONTIUM.* SCHWÆG.

Plants very small, gregarious, simple, having the long frondiform leaves, permanent or vanishing, or sometimes with lateral flagelliform ramuli, bearing very minute imbricated leaves; capsule oval.

2. **GEORGIA BROWNII.** *(Dicks.) C. Muell.*

Autoicous; plants dwarf, gregarious, the stem with or without flagelliform ramuli, the perichætial bracts ovate, acuminate, nerved half-way; capsule oval; lid conic, oblique. (T. IV. B.)

SYN.—*Bryum Brownianum* DICKS. Pl. crypt. Brit. fasc. IV, 7, t. 10, fig 16 (1801). BRID. Musc. rec. ii, P. III, 62 (1803). TURNER in KŒN. and SIMS Ann. Bot. II, 197 (1806).

Tetraphis ovata FUNCK in HOPP. Bot. Tasch. 1802, 41, et in Reg. bot. Zeit. 1802, 120. HOPP. in STURM Deutschl. Fl. ii, Heft 6 (1803). SPRENG. Einl. 275, t. 6, f. 52 (1804). BRID. Sp. Musc. i, 84 (1806); Mant. musc. 26 (1819); Bry. univ. i, 131 (1826). WEB. MOHR Bot. Tasch. 95 (1807). SCHKUHR Deutsch. krypt. Gew. ii, 33, t. 13 (1810). SCHWÆGR. Suppl. I, P. I, 39, t. 13 (1811). RÖHL. in Ann. Wett. Ges. iii, 88 (1812). Sw. Summ. Veg. Scand. 38 (1814). WALLM. in LILJEBL. Sv. Fl. 3 ed. 529 (1816). HOOK Fl. Lond. n. s. t. 114 (1817); Fl. Scot. P. 2, 124 (1821). SMITH Comp. Fl. Brit. 3 ed. 163 (1818). HK. TAY. Musc. brit. 17, t. 8 (1818). HARTM, Sk. Fl, 1-4 ed. (1820-43). GRAY Nat. Arr. Br. Pl. i, 717 (1821). W.-ARN. in Mem. Soc. d'Hist. nat. Par. ii, 262 (1825). NEES HSCH. St. Bry. germ. ii, P. I, 5, t. 13, fig. 1-2 (1827). WALLR. Fl. crypt. Germ. I, 117 (1831). HUEBEN. Musc. Germ. 73 (1833). AONGST. Disp. musc. Scand. 14 (1842).

Tetraphis rigida HED. FIL. Obs. bot. i, 7, T. I (1802). WAHLENB. Fl. suec. ii, 770 (1826). SWARTZ Adnot. bot. 82 (1829). MYRIN in W. Ak. Handl. 1831, p. 261.

Orthotrichum Brownianum SM. Fl. Brit. iii, 1269 (1804). BRID. Sp. Musc. P. 2, 11 (1812).

Grimmia Browniana TURN. op. c. i, 522, in nota (1805). SM. Eng. Bot. t. 1422 (1805).

Tetraphis Browniana GREV. Fl. Edin. 230 (1824); Scot. Crypt. Fl. iii, t. 169 (1826). W.-ARN. l. c. BRID. Bry. univ. i, 133 (1826). HOOK. T. op. c. 2 ed. 33 (1827). N. H. St. op. c. 9. WALLR. op. c. 118. HUEBEN. op. c. 74. DUBY Bot. gall. ii, 577 (1830). HOOK. Br. Fl. ii, 14 (1833). MACKAY Fl. Hib. P. 2, 12 (1836). HAMPE in Regens. bot. Zeit. XX, P. 1, 280, n. 1. cum Var. *ovata* (1837). HARTM. op. c. 5-9 edd. (1849-64).

Tetrodontium Brownianum SCHWGN. op. cit. ii, P. I, 102, t. 129 (1824). MOUG. NEST. St. Cr. n. 811. BR. SCHIMP. Bry. Eur. iii, Mon. 4, t. 2 (1843). AONGSTR. in FR. Summ. Veg. Sc. i, 92 (1846). WILS. Bry. brit. 197, t. 8 (1855). SCHIMP. Synops. 283 (1860); et 2 ed. 351 (1876). BERK. Handb. Br. M. 216, t. 19, f. 7 (1863). MILDE Bry. Siles. 245 (1869). HOBK. Syn. Br. M. 99 (1873).

Tetrodontium ovatum SCHWGN. op. c. ii, P. I, 102.

Georgia Browniana C. MUELL. Syn. i, 181 (1848). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 231 (1848). SPRUCE Trans. Bot. Soc. Edin. iii, 153 (1849); et Ann. Mag. N. Hist. 2 Ser. iii, 359 (1849). LINDB. in Not. ur Sällsk. Fn. et Fl. fenn. 151 (1867).

Tetrodontium varium a. *foliatum* et β. *frondiferum* LINDB. in Ofr. V. Ak. Förh. XX, 414 (1863).

Autoicous; plants very small, simple, gregarious, radiculose at base, with very short decumbent stems, bearing the terminal inflorescence. Radical frondiform leaves long, linear-cuneate or somewhat palmate at apex, of 2-3 layers of cells; or else bearing flagelliform branches covered with lanceolate, entire, nerveless leaves.

Perichætial bracts numerous, imbricated, outer much smaller, all ovato-lanceolate, faintly nerved at base, entire, the cells oval, capsule solitary, on a rigid purple pedicel, erect, oval, symmetric, firm, olive-brown, becoming blackish by age; calyptra covering all the capsule, glossy reddish-brown, more deeply slit, unequally plicate; operculum one-third length of capsule, dull yellow, conic or rostellate; mouth of capsule exannulate, more or less emarginate opposite the interspaces between the teeth; teeth shorter and broader than in *G. pellucida;* spores greenish-yellow. Male infl. gemmiform, the bracts fewer, oval, pointed, nerveless, paraphyses short.

HAB.—Sandstone and gritstone rocks, not very uncommon in Scotland, N. of England, and Ireland. Fr. 7.

On rocks by the river at Rosslin, Edinburgh (*Brown*). Bilston burn (*Maughan*). Kirkcaldy (*Chalmers*). Arniston and Auchindenny woods (*Greville and Arnott*). Rae hills woods, Dumfries (*Jardine*).

Common in Yorkshire as at Keb Clough, Todmorden (*Nowell* 1848)!! Rigg mill and Goathland beck, Whitby (*Braithwaite*)!! Cronkley gill (*Spruce*)! Healy hall, Rochdale (*Hobson*). Ripon (*Brunton*). Dene at Twizell House, Berwick (*Greville*), and Lyham Dene (*Boyd*). Cornwood cascade and Fox-tor, Devon (*Holmes*). Hays wood, Meavy (Fl. dev.). Ardingly, Sussex (*Davies*).

Irel.—Head of Kelly's glen, Dublin, and near Ballycastle, Antrim (*Moore* 1835). Lough Bray (Fl. Hib.).

Tetraphis ovata FUNCK is a state in which the radical frondiform leaves are short or altogether wanting.

Tetraphis repanda FUNCK is only a variety of *G. Brownii*, having the mouth of capsule slightly more emarginate, and sending from the roots

flagelliform ramuli with densely imbricated, nerveless ovato-lanceolate leaves; so far as we know it has not been detected in this country.

Georgia Brownii most frequently occurs on the upper surface of horizontal fissures in sandstone rocks, and then the capsule is of course the lowest part; when found on the upright faces of rocks the seta stands out horizontally or curves gently upwards. Creeping among the felt-like stratum may also generally be found associated some of the smaller liver-mosses, as *Diplophyllum albicans*, &c.

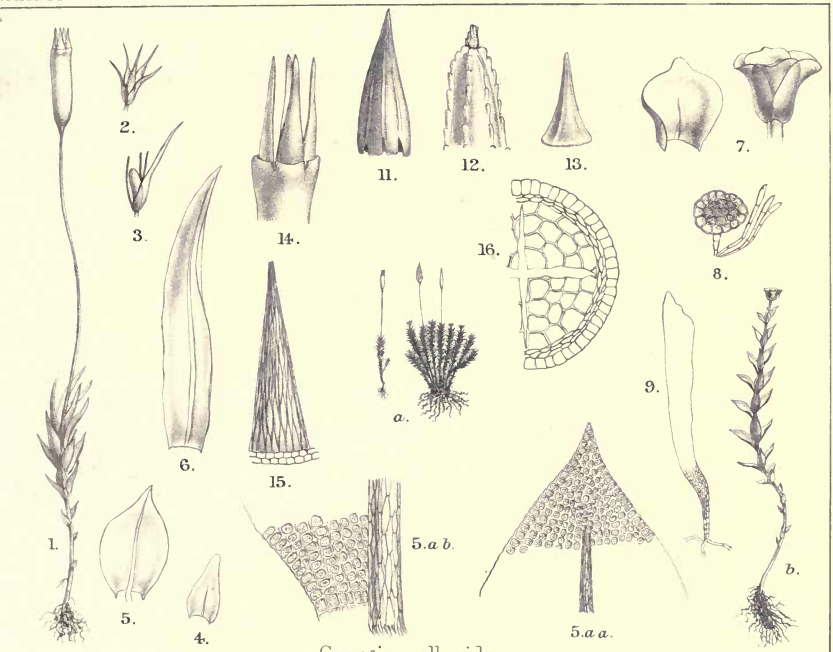
Lindberg aptly compares the radical frondiform leaves to minature fronds of the elks-horn fern *Playtycerium alcicorne*.

Tab. IV.

A. *Georgia pellucida* (Bexley, *Mr. George*).

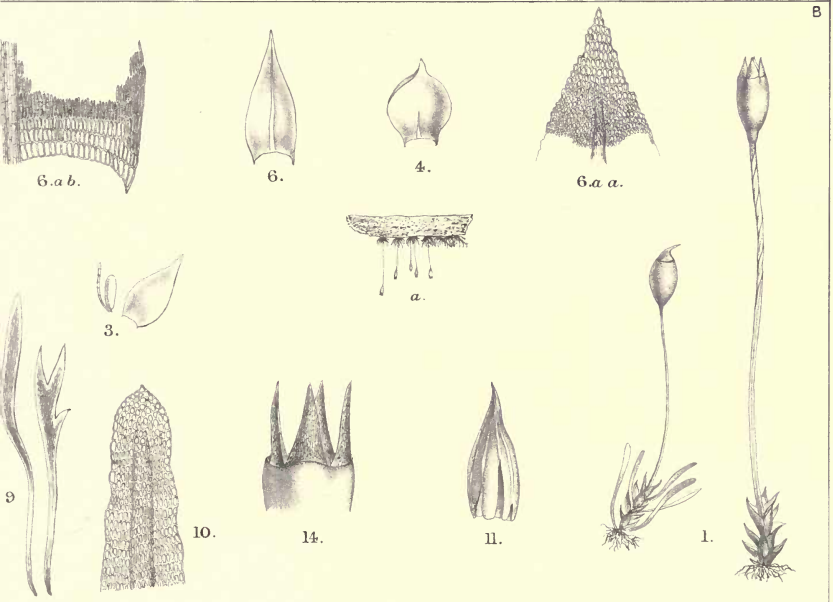
B. *Georgia Brownii* (Rigg mill, Whitby, *Braithwaite*).

a. Perfect plants. 1. Fertile plant mag. b. Gemmiferous plant mag. 2. Male infl. 3, Bract, antheridium and paraphyses. 4. Lower leaf. 5. Upper leaf of plant b. 5 aa. Areolation of apex. 5 ab. Ditto of base. 6. Perichætial bract. 6 aa. Areolation of apex. 6 ab. Ditto of base. 7. Cup with one of its bracts. 8. Lentiform gemma and paraphyses. 9. Frondiform leaves. 10. Apex of same more mag. 11. Calyptra. 12. Apex of same more mag. 13. Operculum. 14. Mouth of capsule and peristome. 15. Single tooth of same. 16. Transverse section of half of operculum and peristome.



Georgia pellucida.

B



Georgia brownii.

Braithwaite del. ad nat. D. Blair lith. Mintern Bros imp.

POLYTRICHACEÆ.

NOVEMBER 1ST, 1880.

CATHARINEA Ehrh.

1. **C. angustata** *Brid.*
2. — **undulata** (*L.*) *Web. Mohr.*
3. — **crispa** *James.*

OLIGOTRICHUM Lam. De C.

1. **O. incurvum** (*Huds.*) *Lindb.*

POLYTRICHUM Dill. L.

1. **P. subrotundum** *Huds.*
2. — **aloides** *Hedw.*
3. — **urnigerum** *L.*
4. — **alpinum** *L.*
5. — **sexangulare** *Floerke.*
6. — **gracile** *Dicks.*
7. — **attenuatum** *Menz.*
8. — **piliferum** *Schreb.*
9. — **juniperinum** *Willd.*
10. — **strictum** *Banks.*
11. — **commune** *L.*

Fam. 4. POLYTRICHACEÆ.

Mosses variable in size and habit; sometimes short and simple, sometimes very tall, dendroid and branched, with the stem highly developed, having a central woody axis.

Innovations basal, or in the male plants the axis is continued from the centre of the inflorescence. Leaves firm and rigid, the nerve generally expanded and bearing on the upper surface a variable number of more or less developed vertical lamellæ, which vanish toward the sheathing base of the leaf; the margin usually serrate, the cells of the non-lamellose part mnioid.

Inflorescence almost always dioicous, the male discoid with the bracts often coloured.

Calyptra cucullate, naked or spinulose or with a few hairs, or most frequently covered with long villose pendent hairs. Capsule on a long wiry pedicel, terete or angular or rarely depressed, with stomata frequently present in the cuticle.

Peristome of 32 or 64 erect, solid, linguiform teeth, united at apex to the discoidal dilated extremity of the columella (the epiphragm or tympanum); sometimes broken up into a pencil of cilia; very rarely none. Inhabiting the ground, especially on moorlands, and often occupying extensive tracts.

This great family of 200 or more species, is a most natural one, approaching the Mniaceæ in some points, but yet possessed of characters quite peculiar; notably the solid tongue-shaped teeth, the membranous dilated discoid top of the columella, the lamelligerous leaves, and the densely pilose calyptra. By the well-developed fibro-vascular cells forming a woody axis to the stem, and the noble tree like habit of some exotic forms, we may perhaps regard them as standing at the head of all mosses.

The structure of the peristomial teeth is well worth a careful examination, as it differs from that of all other mosses. Each tooth consists of several layers of fine threads, held together by cellular material, and we can trace each thread down from the apex of one tooth, through the basal membrane, and up again to the apex of the adjacent tooth, those in the axial line being more condensed. The basal membrane is a continuation of the lining of the capsule (endothecal membrane), and consists of several rows of thick-walled rectangular cells.

Prof. Schimper divides the Polytrichaceæ into three sub-families: 1. Polytricheæ, comprising nearly all the species. 2. Lyellieæ, for the genus *Lyellia*, containing two East Indian species, remarkable for the absence of peristome, though with a button shaped epiphragm closing the mouth of the capsule. 3. Dawsonieæ, including the Australian genus *Dawsonia* of 4 species, among which stands *D. superba*, one of the most

beautiful of known mosses; here both the peristome and endostome are broken up into a brush-like tuft of cilia, and there is no epiphragm. In both these genera we recognise a certain affinity to *Buxbaumia* by the depressed, ovate and somewhat irregular capsule, and again the scabrous seta of *Buxbaumia* is represented in the Malayan *Racelopus*, a feature quite exceptional in this family, where it is usually polished and wiry. Lindberg's paper "*Observationes de formis presertim europæis Polytrichoidearum*," in Notis. ur Sällsk. pro Fn. et Fl. fenn. förh. ix, p. 91 (1867), is perhaps the most perfect example of a botanical dissertation which has ever come before us.

In this a very curious relation existing between the peristome and epiphragm is pointed out and used to divide the genus *Polytrichum* into two sections *Pterygodon* and *Leiodon*, but as the parts are very minute and would offer difficulties to students in their examination, we have preferred the older divisions of C. Mueller.

A part of this beautiful combination was first accurately made known by our celebrated countryman Richard Spruce in his paper on "*The Mosses and Hepaticæ of the Pyrenees*," in Trans. Bot. Soc. of Edinburgh, iii, 162 (1849); and as these structures are so important, it may be of interest to quote the descriptions of both authors.

Spruce says,—"In *Polytrichum alpinum* the epiphragm is originally placed at the base of the teeth, to which it is attached by means of processes equal to them in number, and exactly covering their internal face. After the fall of the lid, these processes are gradually detached, and the epiphragm rises, probably from the pressure of the full-grown spores beneath it, so as to allow the latter to escape through the interstices of the peristome. When the epiphragm is quite liberated, the processes curve inward upon its upper surface, so as to be with difficulty seen, unless the light be properly regulated, or the epiphragm be set up on its edge. The adhesion of the epiphragm to the teeth is so great as to resist the action of the columella to draw it down into the capsule, and often ultimately to cause the columella to rupture."

Lindberg's description is as follows,—"In the *Polytrichaceæ* the teeth are incurved and in transverse section triangular, especially at the base; the inner surface of the teeth is elevated in the middle into a longitudinal crest, which is composed of the innermost cells of the basal membrane not reaching the apex of the tooth. The apices of these cells in the subgenus *Pterygodon* are not united to the teeth, but inflexed, free or irregularly connected with each other, and form wings, compressed at the sides, and resembling stag's horns. These wings are formed both from the basal membrane itself, and the lower part of the crests of the teeth, and are somewhat coloured or hyaline; they enclose chambers of the same number as the teeth, in the mouth of the capsule, the fundus of which is formed by the basal membrane, the walls by the teeth and their wings, and the roof by the epiphragm; these spaces are fenestræ for the exit of the spores, when the spore sac finally bursts at apex. The species referred to *Pterygodon* are *P. commune*, *juniperinum*, *strictum* and *piliferum*, and in these also the epiphragm is thin, flat and strictly contained between the apices of the peristome, to which it closely adheres by the margin. From its lower surface and within the margin, hang down sacculi or nipple—like processes, closing the upper part of the interdental spaces, almost to the middle of the teeth, and as many in number as the

interspaces. In the young state, these mamillæ reach down to the basal membrane, but in the mature fruit contract by drying, and the spore sac also rupturing, through these apertures, as in the fruit of *Papaver* and *Campanula*, the spores escape. The remaining species form the subgenus *Leiodon* and in this as well as in *Catharinea* and *Oligotrichum* the wing-like crest is wanting, the epiphragm is thick, concave, and generally somewhat hollowed in the centre, the margin toothed with thin processes curved upward and inward, and closely fixed to the upper part of the teeth, which they resemble in structure. For this reason the epiphragm is not strictly contained within the apices of the peristome, but hangs down from them for the length of the dentiform processes, connate with the highest part of peristome. Mamillæ are also absent from the under surface, and the spores are much larger."

The leaves of Polytrichaceæ, except in *Catharinea* and *Racelopus*, are thick and opake, from the presence on the upper surface of numerous longitudinal lamellæ, and the number and structure of these lamellæ, as seen in transverse section, are as Prof. Lindberg points out, of the greatest importance for a proper discrimination of the species, especially in the barren state; the cells forming their free margin are particularly to be noted, as they vary considerably in different species.

In *Catharinea* the lamellæ are few and confined to the nerve, and are chlorophyllose like the leaf lamina, but in *Polytrichum* the lamellæ alone have chlorophyllose cells.

Pogonatum is not separable from *Polytrichum* as a natural genus, for in a large proportion of species referred to *Pogonatum* (forming the section *Anasmogonium* MITT.), the capsule is 6—8 plicate, while in some *Polytricha* the angles of the capsule are almost obsolete.

It may be noted that *Pol. commune* is one of the few mosses which have been put to economic purposes. Linnæus tells us that the Laplanders use it for beds, and commends it as not harbouring fleas or any infectious disease; in the north of England it is also made into small dusting brooms and mats.

1. CATHARINEA EHRHART.

(Hannov. Mag. 1780, 59 Stück, p. 933; et Beitr. i., pp. 126 et 178 (1787).

Plants mnioid, gregarious or cœspitose, throwing up erect stems from a creeping, subterranean rhizome. Leaves lingulate or oblong, generally undulated, crisped when dry; bordered and serrate at margin; the nerve with few lamellæ; areolation chlorophyllose, rounded—hexagonal. Calyptra narrow, cucullate, spinulose only at apex. Capsule oval or cylindric, subarcuate; annulus none; lid convex, long-beaked; teeth of peristome 32, lingulate, rigid, with a narrow basal membrane; sporangium close to the wall of capsule; spores minute, smooth. Inflorescence usually dioicous; the male cup-like, with numerous bracts and filiform paraphyses.

This genus was founded by Ehrhart in honour of Catharine II. Empress of Russia, and for the reasons stated under *Georgia*, yet Schimper displaces it

for the much later name of P. Beauvois, and then absurdly confers Ehrhart's name on *Pol. dendroides* BRID. and *squamosum* HOOK. WILS. both unknown to Ehrhart.

The genus includes some 25 species, the majority of which are natives of South America, and closely approximate in habit. One other species (*C. tenella* RÖHL.) is European, and has been several times recorded as British, but I have not seen any genuine native specimens.

C. undulata, although so common, is a most elegant moss, and is certain to be among those that first attract the notice of a young collector.

CLAVIS TO THE SPECIES.

Leaves lingulate, undulated.
Dioicous. Leaves with obtuse points, densely areolate, margin serrate only in upper half. *C. angustata.*
Paroicous. Leaves with acute points, more laxly areolate, margin serrate throughout. *C. undulata.*
Leaves oblongo-lanceolate, not undulated. *C. crispa.*

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1. CATHARINEA ANGUSTATA *Brid.*

Dioicous. Leaves shorter, narrowly lanceolate, obtusely pointed, more minutely areolate, serrate only above the middle; lamellæ higher and more numerous. Capsule erect, slender cylindric; lid with a shorter beak. (T. V, A.)

SYN.—*Bryum Juniperi foliis rugosis, capsulis rectioribus* DILL. Hist. musc. 362, n. 19, t. 46, fig. 19 (1741), et Herb.

Polytrichum undulatum var. *minus* MICHX. Fl. bor.-amer. ii, 295 (1803). BALS. DE NOT. Prodr. bryol. mediol. 25 (1834).

Atrichum controversum P. BEAUV. Prodr. 42, excl. syn. (1805).

Pol. angustatum BRID. Sp. musc. i, 79 (1806). SCHWAEGR. Suppl. i, P. II, 331 (1816). HOOK. musc. exot. i, t. 50 (1818). SCHULTZ Suppl. Fl. Starg. 88 (1819). WALLR. Fl. cr. germ. i, 195 (1831). DE NOT. Syll. musc. 215 (1838).

Pol. cylindricum SWARTZ in MUEHL. Catal. pl. amer. sept. 99 (1813), et Adnot. bot. 171 (1829).

Catharinea angustata BRID. Mant. musc. 204 (1819); Bry. univ. ii, 105 (1827). STEUD. Nom. crypt. 101 (1824). HUEBEN. Musc. germ. 519 (1833). C. MUELL. Syn. musc. i, 193 (1849). HARTM. Skand. Fl. LINDB. in Not. ur Sällsk. Fn. et Fl. fenn. ix, 145 (1867). DE NOT. Epil. Briol. Ital. 344 (1869).

Pol. (*Oligotrichum*) *angustatum* W.-ARN. in Mem. Soc. d'Hist. nat. Paris, ii, 320 (1825).

Atrichum angustatum BR. SCHIMP. Bryol. eur. iv, mon. 9, t. 3 (1844); Syn. musc. eur. 434 (1860), et 2 ed. 528 (1876). MILDE Bry. siles. 246 (1869). BERK. Hand. Br. m. 213 (1863). HOBK. Syn. Br. m. 100 (1873). HUSNOT Mouss. du Nord-Ouest 134 (1873).

Dioicous; gregarious or laxly tufted; resembling *C. undulata* in habit, but smaller and more slender, and of a more obscure or reddish tint. Stems about 1 in. high, simple erect. Leaves crowded, linear-lanceolate, shorter and firmer than in *C. undulata*, less undulated, erecto-patent, more crisp when dry, less spinulose at back, more densely and minutely areolate; the apex somewhat obtuse, the margin reflexed below, very narrowly bordered, and serrate only in the upper

part; lamellæ 5—7, much higher, and occupying most of the apex of leaf, in section each of 4—6 small rounded cells. Capsule on a purple seta, erect or a little inclined, straight or subarcuate, narrowly cylindric, purple red; calyptra very narrow, spinulose at point; lid dark purple, glossy, with a shorter beak; teeth of peristome narrower. Male plants in separate tufts; infl. cup-shaped, inner bracts broadly obovate with the nerve thickened at apex.

HAB.—Clay and sandy soil in shady places. Very rare. Fr. 11—1.

Wet sand banks at Hassocks, near Hurstpierpoint, ♂ and fr. (*Mitten* 1846)!! Steep stony pastures near Doune, Perthshire, c. fr. (*McKinlay* 1864)!

Readily known from *C. undulata* by its slender habit, olive-green tint, and shorter, blunt-pointed leaves, which are more minutely areolate. Much more frequent in America than in Europe.

2. CATHARINEA UNDULATA (*L.*) *Web. Mohr.*

Paroicous. Leaves increasing in size upward, lingulato-lanceolate, undulate in the upper half, acute, margin narrowly bordered and dentate nearly to base; lamellæ 2—5, low. Capsule cylindric, arcuate; lid long-beaked. (T. V, B.)

SYN.—*Adiantum seu Polytrichum aureum medium* RAY Hist. Pl. i, 124 (1686), et Syn. Stirp. Brit. 1 ed. 19 (1690).

Muscus capillaris majusculus, foliis longis cum aliqua latitudine, viridibus, acutis rugosis RAY Syn. 2 ed. 29, n. 6 (1696). MORIS. Hist. pl. Oxon. iii, 631, t. V, f. 10 (1698).

Bryum erectum, capitulis oblongis, rubentibus, foliis oblongis, angustis pellucidis rugosis DILL. Cat. Giss. 222 (1719), et in Ray Synops. 3 ed. 95, n. 15 (1724).

Bryum Phyllitidis folio rugoso acuto, capsulis incurvis DILL. Hist. musc. 360, n. 18; t. 46, f. 18 (1741) et Herb.

Bryum undulatum L. Sp. Pl. ii, 117, n. 10 (1753), et Syst. nat. ii, 701. HUDS. Fl. angl. 406 (1762). OEDER Fl. Dan. t. 477. WEISS Cr. Gott. 196 (1770). WITHER. Bot. arr. Br. Veg. ii. 673 (1776). LIGHTF. Fl. Scot. ii, 722 (1777). CURT. Fl. Lond. i, t. 70 (1778). WEB. Spic. Fl. gott. 171 (1778). RELH. Fl. cant. 404 (1785). HOFFM. Deutsch. Fl. ii. 40, t. 1 (1796). ABBOTT Fl. bedf. 243 (1798). HULL Br. Fl. P. 2, 265 (1799).

Bryum phyllitidifolium NECK. Meth. musc. 203 (1771).

Catharinea Callibryon EHRH. in Hann. Mag. 1780, p. 934, et Beitr. i, 126 (1787). C. MUELL. Syn. musc. i, 192 (1849).

Mnium undulatum SWARTZ Meth. musc. 27 (1781). L. FIL. Meth. musc. 364 (1787).

Polytrichum undulatum HEDW. Fund. ii, 90 (1782); Stirp. cr. i, 43, T. xvi-xvii (1787); Sp. musc. 98 (1801). WILLD. Fl. berol. n. 915 (1787). ROTH Fl. germ. i, 458, et iii, 354 (1788). TIMM Fl. meg. n. 773 (1788). SCHRANK Baier. Fl. ii, 448 (1789). BRID. Musc. rec. ii, P. I, 92 (1792); Sp. musc. I, 78 (1806). SIBTH. Fl. Oxon. 307 (1794). MOENCH Pl. marb. 736 (1794). SWARTZ Musc. suec. 78 (1798). RÖHL. Moosg. Deuts. 201 (1800). RICH. in MCHX. Fl. bor. amer. ii, 295 (1803). STURM Deutsch. Fl. ii, 2 (1803). SMITH Fl. Brit. iii, 1382 (1804); Eng. Bot. t. 1220 (1803). TURN. Musc. hib. 91 (1804). SCHULTZ Fl. starg. 287 (1806). SCHWAEGR. Suppl. I, P. 2, 300 (1816). MART. Fl. cr. erl. 79 (1817). HOOK. TAYL. Musc. Br. 23, T. X (1818). GRAY Nat. arr. Br. pl. i, 719 (1821). HOOK. Fl. Scot. P. 2, 125 (1821); Brit. Fl. ii, 48 (1833). FUNCK Moostasch. 70, t. 57 (1821). WAHLEN. Fl. suec. 741 (1826). WALLR. Fl. cr. germ. i, 195 (1831). MACKAY Fl. hib. P. 2, 27 (1836). DE NOT. Syll. musc. n. 214 (1838). FIOR. MAZ. Bry. rom. 2 ed. 28 (1841).

Callibryum polytrichoides WIBEL Prim. fl. Werth. 290 (1799).

Catharinea undulata WEB. MOHR Ind. mus. pl. cr. (1803); Bot. Tasch. 216 (1807). RÖHL. Ann. Wett. Ges. iii, 233 (1814); Deutsch. Fl. iii, 61 (1813). BRID. Mant. musc. 304 (1819); Bry. univ. ii, 102 (1827). HUEBEN. Musc. germ. 517 (1833). RABENH. Deutsch. Kr. Fl. ii, P. 3, 233 (1848). LINDB. in Not. ur Sällsk. Fn. et Fl. fenn. ix, 146 (1867).

Oligotrichum undulatum LAM. DE C. Fl. franc. 3 ed. ii. 492 (1805).

Atrichum undulatum P. BEAUV. Prodr. 42 (1805). BR. SCHIMP. Bry. eur. iv, Mon. 8, T. 1-2 (1844); Syn. musc. 433 (1860), et 2 ed. 528 (1876). WILS. Bry. Brit. 203, t. x (1855). JENS. Bry. dan. t. 3, f. 14 (1856). BERK. Handb. Br. m. 212, t. 19, f. 4 (1863). MILDE Bry. Siles. 246 (1869). DE NOT. Epil. Briol. Ital. 343 (1869). HOBK. Syn. br. m. 100 (1873). HUSN. Mouss. Nord-Ouest 133 (1873).

Cath. Ehrharti VOIT Musc. herbip. 17 (1812).

Callibryum undulatum ZENK. DIETR. Musc. Thur. n. 41 (1822).

Paroicous and polyoicous; gregarious in wide, bright green patches. Rhizome much branched, the roots twisted together like a cable; stems erect, 1—3 in. high, simple or bifid, nearly naked below. Leaves rather lax, not sheathing, concavo-carinate, patulous and flexuose when moist, strongly curled and twisted when dry; lower small, ovate, scale-like, inserted obliquely, the rest increasing in size to the coma, lanceolate, ligulate, and linear-elongate, transversely undulate in the upper half, with a narrow rufescent border of two rows of narrow cells, bearing for greater part of its length callose teeth, usually in pairs, nerve vanishing in the rather acute apex, which is beset with spinules at back in transverse rows; cells rather large, rounded and subhexagonal; lamellæ 3—6, subundulate, in section each of 4—5 nearly equal rounded cells. Perichætial bracts, resembling the comal leaves but longer and narrower.

Pedicel as long as stem, bright-red, erect, twisted to the right in upper part when dry, single or in pairs; capsule pachydermous, brown, cylindric, inclined, arcuate, with a very short neck: lid from a hemispherical purple base, subulato-rostrate, the beak slender, long as capsule, straight or curved downward or upward; teeth longish, orange in the axis, basal membrane rufescent. Male infl. terminating the first year's stem, the same axis growing on and producing female the next year; perigone cup-shaped, bracts numerous, inner broadly cuneiform-truncate with a crenulate, recurved point, and thin nerve.

HAB.—On clay or sandy soil in woods, by the side of paths and on hedge-banks. Common. Fr. 11—12.

Schimper records that occasionally the stem produces fruit the first year without any preceding male inflorescence.

Var. *β.* **Minor** (*Hedw.*) *Web. Mohr.*

Stem short; leaves crowded, shorter, less undulated. Capsule suberect, ovate-oblong, unequal, on a shorter pedicel.

SYN.—*Polytrichum undulatum* var. *β. minus* HEDW. Stirp. crypt. i, 43, t. 17, f. 14—21 (1787), et Sp. musc. 98. WAHLENB. Fl. lap. 349. MACKAY Fl. hib. P. 2, 27.

Pol. (*Catharinea*) *controversum* RÖHL. Moosg. Deutsch. 206.

Oligotrichum undulatum var. *β. minus* LAM. DE C. Fl. franc.

Cath. undulata β. minor WEB. MOHR Bot, Tasch. 217. BRID. Mant. musc. 204; Bry. univ. ii, 104.

Atr. undulatum var. *γ. abbreviatum* Bry. eur.

Cath. undulata var. *β. abbreviata* RABENH. Deutsch. Krypt. Fl. ii, P. 3, 233.

HAB.—In bare stony places. Not common.

Catharinea tenella RÖHL. has been recorded as British, but we believe erroneously, we have seen specimens so-called from the following localities :—

1.—Strensall moor, Yorkshire (Dr. Spruce 1847); referred by Schimper to *C. tenella* is certainly only a slender variety of *C. undulata* growing in sand, and Mr. Boswell informs me that Schimper afterwards called it *Atr. undulatum* Var. *tenelliforme;* it may be the same as the American Var. *attenuatum* of Bry. Eur.

2.—Hell's mouth, Loch Goil head (Dr. Nichol); also a form of *C. undulata.*

3.—Wet places by the road between Ben Lawers and Killin (McKinlay 1865); belongs to *C. undulata* Var. *minor.*

C. tenella is a good species; dioicous, having stems ½—1 in. high; leaves oblongo-lanceolate, scarcely undulate, dull green; capsule oblongo-cylindric, about half the length of that of *C. undulata*, inclined, lid large conic, tumid, rufous, with a nearly straight pale beak rather shorter than capsule.

3. CATHARINEA CRISPA *James.*

Dioicous. Leaves distant, crisped when dry, oblongo-lanceolate, scarcely undulated, smooth at back; lamellæ 1—3, very narrow. Capsule oblong, suberect; lid conic, shortly rostrate. (T. V, C.)

SYN.—*Catharinea crispa* JAMES in Proc. ac. nat. sc. Phil. vii, 445 (1855). LINDB. in Not. ur Sällsk, pro Faun. et Fl. fenn. förh. ix, 149 (1867).

Atrichum crispum SULL. in Gray Man. Bot. U. St. 2 ed. 41 (1856), et Icon. musc. 73, T. 46 (1864). BRAITHW. in Jour. of Bot. 1870, 225, t. 109, f. 1. HOBK. Syn. br. m. 101 (1873). SCHIMP. Syn. musc. 2 ed. 530 (1876).

Atr. laxifolium WILS. M.S.

Atr. tortifolium SULL. M.S.

Dioicous; in soft lurid-green tufts. Stems tall, slender, simple, with very distant leaves, rooting only at base, 2—4 in. high. Leaves large, crisped when dry, patent when moist, nearly flat, scarcely undulated, quite smooth at back; from a narrowed base, elongato-oblongo-lanceolate, rather obtuse, border very narrow, rufescent, formed of two layers of cells, remotely toothed, the teeth small and usually in pairs; nerve thick, vanishing in the apex, sometimes with a few spines at back, lamellæ very low and indistinct, 1—3, in section showing a row of 1—3 rather lax rounded cells; areolation lax, the basal cells rectangular, hyaline, empty, the rest irregular, rounded and hexagonal, chlorophyllose; perichætial bracts larger and more acute. Pedicels slender, 1—3 in each perichætium, capsule suberect, often a little curved, oblong-obconic, wide-mouthed, brown; lid conic with a subulate beak, calyptra scabrous at apex; peristome with scarcely any basal membrane, the teeth narrow, unequal, hyaline with a purple median line.

Male plants in distinct tufts, taller and more slender; infl. discoid, inner perigonial bracts narrow at base, suddenly expanded and then contracted into an acute point, the nerve slightly lamellose at apex.

HAB.—Among stones and grass by the sides of streams, and among the sandy deposit washed down by the water, not common. Male and barren plants only.

Boggy ground, Rowley moor, near Rochdale (*Nowell* 1848). Staley brushes, Lancashire (*Dr. Wood* 1860) ! ! Keb clough, Todmorden (*Nowell* 1860). Several places near Hebden bridge, Yorkshire, and in the Saddleworth district (*Hunt, Hobkirk*) ! ! Rattle brook, Dartmoor (*Mr. Brent*) ! ! and Tay Cleave (*Holmes* 1868). Near the head of the Luchir, Carmarthen (*Rev. A. Ley* 1878) ! !

Var. *β.* **Densifolia** *Lindb.* Op. cit. p. 150.

Plants dwarf, dense leaved; leaves broader, elliptical, more patulous.

SYN.—*Atrichum crispum* var. *foliis latioribus, ellipticis* WILS. MSS.

HAB.—Oakmere, Cheshire (*Wilson* 1860) ! Male plant only.

The fertile plant has only been found in N. America, and has a shorter stem, with the leaves denser, longer, more lingulate and crisped.

2. OLIGOTRICHUM LAM. DE C.

(Fl. franc. 3 ed., ii, 491 (1805).)

Stems simple, innovating from subterranean stolons. Leaves lanceolate or oblong, incurved when dry, very concave; lamellæ numerous, high, strongly undulated. Capsule erect, ovate-oblong, terete, or gibbose and compressed; calyptra cucullate, with a few scattered hairs or naked; lid conic, rostrate; teeth of peristome slender, irregular.

This genus is named from the calyptra having "few hairs," and stands immediately between *Catharinea* and *Polytrichum*, agreeing with the former in its mode of growth and capsule, and with the latter in its rigidity, more opake leaves and areolation.

Several other allied genera have been formed, which are perhaps better regarded as sections of the present, and we thus have 1. *Euoligotrichum*, of which our British species is the type, and including others from South America and the E. Indies; 2. *Psilopilum*, of five species, one of which is found in the extreme north of Europe; *Ol. glabratum* (WAHL.)—*Psilopilum arcticum* BRID. 3. *Dendroligotrichum*, represented by the giant *Pol. dendroides* BRID. 4. *Polytrichadelphus*, embracing some 20 species, nearly all South American.

Although the character of the genus differs but little from that of *Catharinea*, it has a peculiar habit which is very striking in the growing state, and the lid is so slightly attached, that it generally falls away with the calyptra.

OLIGOTRICHUM INCURVUM *(Huds.) Lindb.*

Dioicous; stems short, simple. Leaves patent, incurved, lanceolate, concave, involute above, subserrate, lamellæ numerous, undulated. Capsule erect, ovato-cylindric; lid conic, acuminate. (T. V, D.)

SYN.—*Bryum incurvum* HUDS. Fl. Angl. 2 ed. 479 (1778).

Catharinea hercynica EHRH. Beitr. i, 190 (1787). WEB. MOHR Bot. Tasch. 217 (1807). Fl. dan. t. 1417 (1810). RÖHL. Deutsch. Fl. iii, 61 (1813); Ann. Wett. Ges. iii, 232 (1814). BRID. Mant. musc. 203 (1819); Bry. univ. ii, 99 (1827). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 234 (1848). C. MUELL. Syn. musc. i, 196 (1849).

Polytrichum hercynicum HEDW. St. crypt. i, 40, t. 15 (1787); Sp. musc. 94 (1801). SCHRANK Baier. Fl. ii, 447 (1789); Prim. Fl. sal. 824 (1792). DICKS. Pl. crypt, Fasc. 2, 3 (1790). WITH. Bot. arr. Br. Veg. 3 ed. iii, 797 (1796). BRID. musc. rec. ii, P. I, 91, t. 2, f. 12 (1798); Sp. musc. I, 77 (1806). HULL Brit. Fl. P. 2, 248 (1799). ROTH Fl. germ. iii, 353 (1800). RÖHL. Moosg. Deuts. 197 (1800). SMITH Eng. Bot. t, 1219 (1803); Fl. Br. iii, 1381 (1804). WAHLENB. Fl. Lap. 348 (1812); Fl. Carp. 349 (1814). SCHWAEGR. Suppl. I, P. II, 329 (1816). HOOK. TAY. Musc. Br. 24, t. X (1818). FUNCK Moostasch. 70, t. 57 (1821). GRAY Nat. arr. Br. Pl. i, 720 (1821). HOOK. Fl. Scot. P. 2, 125 (1821); Brit. Fl. ii, 45 (1833). WALLR. Fl. crypt. germ. i, 195 (1831). HUEBEN. Musc. germ. 521 (1833).

Orthotrichum hercynicum HOFFM. Deutsch. Fl. ii, 25 (1795).

Atrichum hercynicum P. BEAUV. Prodr. 42 (1805).

Oligotrichum hercynicum LAM. ET DE C. Fl. franc. 3 ed. ii, 492 (1805). BR. SCHIMP. Bry. eur. iv, mon. 4, t. 5 (1844); Syn. musc. eur. 436 (1860), et 2 ed. 531 (1876). WILS. Bry. Brit. 205, t. x (1855). BERK. Handb. Br. m. 212, t. 19, f. 3 (1863). MILDE Bry. Sil. 247 (1869). DE NOT. Epil. Briol. Ital. 342 (1869). HOBK. Syn. br. m. 101 (1873).

Olig. incurvum LINDB. in HARTM. Skand. Fl. 9 ed. ii, 45 (1864), et in Not. ur Sällsk. Fn. et Fl. fenn. förh ix, 144 (1867).

Dioicous; gregariously cæspitose, in loose tufts, adhering by the earth at roots, pale glaucous green, when old rufescent. Stems about 1 in. high, erect, simple, rigid. Lower leaves remote, minute, appressed, oval, acuminate; upper crowded, rigid, twisted when dry, patent when moist, subarcuate-incurved, very concave, from a pale thin, sheathing base, narrowly lanceolate, the margin inflexed above the middle, remotely serrate in upper part; nerve at back toward apex, with three narrow remotely serrate lamellæ, above with 10—12 high, sinuose, strongly undulated lamellæ, each in section of 5—12 equal rounded cells. Capsule on a thickish orange-red pedicel, twisted to the right above when dry, ovato-cylindric, erect, ferruginous, when dry plicate, contracted below the mouth, and with a few stomata on the neck; lid large, convex-conic, obtusely acuminate, fugacious; teeth of peristome pale, short, unequal; spores very small, smooth.

Male plants short, more slender, the infl. rosaceous, bracts broadly oval, acute, with a lamellar nerve; paraphyses both filiform and spathulate.

HAB.—Bare declivities and sandy ground on mountains. Scotland, Wales, N. of England, Ireland. Fr. 7.

Var. *β.* **Laxum** *Braithw.*

Stems 3—4 in. high, slender, flexuose. Leaves more distant and

divergent, not dilated at base, elongated, pale green, pellucid, with larger areolation ; nerve broader, margin more or less distinctly subserrated.

HAB.—Ben Nevis (*McKinlay* 1863)! near Bangor, N. Wales (*J. Griffiths* 1879)!!

I am indebted to the kindness of Mr. Hobkirk for this very striking variety, only found in the barren state.

3. POLYTRICHUM DILLEN.

(Cat. pl. giss. 211 (1718).)

Plants short and simple, or tall, showy and branched, innovating from radical protonema, or subterranean stolons, or from middle of stem. Leaves from a membranous, sheathing base, rigid, coriaceous, scarce altered by drying, nerve broad, covered with very numerous erect lamellæ, margin spinoso-serrate. Calyptra dimidiate, with straight defluent tomentum, covering all or most of capsule. Capsule erect or cernuous, terete and cylindraceous, or prismatic or cuboid, and 4, rarely 5—6 angled, tapering to a neck or with a small discoid or subglobose hypophysis. Lid convex, apiculate or with a straight beak. Teeth 32 or 64, adhering at apex to the papery epiphragm.

An extensive genus scattered over the whole world and exhibiting great diversity in the size of the individuals, some of the species forming small groups of closely allied forms. Above 100 species belong to the sections with rounded fruit (commonly combined into the genus *Pogonatum*) and about 30 to that of *Eupolytrichum*. The derivation is from πολυς many, θριξ hair.

CLAVIS TO THE SPECIES.

Capsules rounded.
- Leaves short, broadly lanceolate, subinvolute at margin.
  - Leaves obtusely toothed. Capsule subglobose. Columella cylindric. *subrotundum.*
  - Leaves sharply serrate. Capsule longish oval. Columella 4-winged. *aloides.*
- Leaves longer, narrowly lanceolate, acute.
  - Capsule subcylindric, erect, terete, papillose. *urnigerum.*
  - Capsule oblong, tumid, somewhat inclined, smooth. *alpinum.*

Capsules angular.
- Leaves entire with an inflexed margin.
  - Leaves obtuse at apex. *sexangulare.*
  - Leaves aristate at apex.
    - Arista short, sinooth, coloured; stems short, leaves spreading, recurved; capsule square, prismatic. *juniperinum.*
    - Arista the same; stem tall, leaves erecto-patent, straight; capsule small, cuboid. *strictum.*
    - Arista longer, rough, hyaline. *piliferum.*
- Leaves sharply serrated, plane, acuminate.
  - Capsule ovate, obscurely angled, lid rostrate ; leaves short. *gracile.*
  - Capsule oblong, 4—6 angled, leptodermous; lid conical, pointed. *attenuatum.*
  - Capsule cubic, acutely 4-angled, pachydermous, with a distinct hypophysis ; lid conico-rostellate *commune.*

Sect. 1. *ALOIDELLA* C. MUELL.

Stem short. Leaves few, rather broad, more or less involute, resembling those of a miniature aloe. Capsule oval or cylindric.

1. **POLYTRICHUM SUBROTUNDUM** *Huds.*

Dioicous; subgregarious. Stem very short, simple; leaves patent, lanceolate, rather obtuse, remotely denticulate above. Capsule globose-urceolate, wide-mouthed; lid conic, rostellate. (T. VI, A.)

SYN.—*Adiantum aureum minus, capitulis rotundis*, BOBART. RAY Syn. St. Br. 1 ed. app. 237 (1690).

Polytrichum minus, capsulis subrotundis, calyptra quasi lacera coronatis DILL. Giss. 221 (1719), et Syn. 3 ed. 91, n. 3 (1724).

Polytr. nanum, capsulis subrotundis galeritis, aloes folio non serrato DILL. Hist. musc. 428, t. 55, f. 6 (1741) et Herb.

Mnium polytrichoides a. L. Sp. Pl. ii, 1112, n. 13 (1753). POLLICH Pl. palat. n. 990 (1777).

Ditto Var. rotundifructum EHRH. in Hann. Mag. 1780, 236.

Polytr. subrotundum HUDS. Fl. Angl. 400 (1762). CURT. Fl. Lond. t. 68 (1778). RELH. Fl. Cant. Suppl. 16 (1786). WITH. Bot. arr. Br. Veg. 3 ed. 786 (1796). MENZ. in Tr. Lin. Soc. iv, 68, n. 2 (1798). HULL Br. Fl. P. 2, 247 (1799). SMITH Fl. Brit. iii, 1378 (1804); Eng. Bot. t. 1624 (1806). TURN. Musc. hib. 89 (1804). MART. Fl. crypt. Erlang. 80 (1817). DUBY Bot. gall. ii, 547 (1830). LINDB. in Not. ur Sällsk. Fn. Fl. fenn. förh. ix, 141 (1867.)

Polytr. nanum NECK. Meth. musc. 119 (1771). SCHREB. Spic. fl. lips. 74 (1771). SWTZ. Meth. musc. 26, n. 6, p.p. (1781). LEYSS. Fl. hal. 2 ed. 263 (1783). HEDW. St. crypt. i, 35, t. 13 (1787); Sp. musc. 95 (1801). MENZ. SM. TURN. MART. op. c. TIMM Fl. meg. n. 771 (1788). ROTH Fl. germ. i, 458 (1788). SIBTH. Fl. Oxon. 306 (1794). BRID. Musc. rec. ii, P. I, 88 (1798); Sp. musc. I. 71 (1806); Mant. 200 (1819). HULL Br. Fl. P. 2, 247 (1799). SCHULTZ Fl. Starg. 286 (1806). Eng. Bot. t. 1625 (1806). WEB. MOHR Bot. Tasch. 227 (1807). VOIT Musc. herb. 61 (1812). SCHWAEGR. Suppl. i, P. 2, 324 (1816). HOOK. TAYL. Musc. Brit. 28, t. 11 (1818). FUNCK Moostasch. 70, t. 57 (1821). HOOK. Fl. Scot. P. 2, 126 (1821); Brit. Fl. ii, 51 (1833). WALLR. Fl. crypt. germ. i, 197 (1831). HUEBEN. Musc. germ. 524 (1833). RABENH. Deutsch. Kr. Fl. ii, P. 3, 235 (1848). C. MUELL. Syn. musc. i, 204 (1849). HARTM. Skand. Fl.

Pol. nanum var. *β.* WEISS Fl. gott. 175 (1770). HUDS. op. c. 2 ed. 470 (1778).

Pol. aloïfolium β. SCOP. Fl. carn. 2 ed, ii, 310 (1772).

Pol. ericoides HOFFM. Deutsch. Fl. ii, 24 (1795). WIB. Fl. Werth. 291 (1799).

Pol. pumilum SWARTZ in W. ak. nya Handl. xvi, 271 (1795); Disp. musc. Suec. 77 et 108, t. ix, f. 19 (1799), et Adnot bot. 166 (1829). BRID. Sp. musc. I, 69 (1806), Mant. musc. 199. HEDW. Sp. musc. 97, t. 21, f. 7-9 (1801). STEUD. nom. crypt. 353 (1824).

Pogonatum pumilum P. BEAUV. Prodr. 84 (1805). BRID. Bry. univ. ii, 116 (1827).

Pog. nanum P. BEAUV. l. c. et in Mem. soc. Linn. Par. i, t. xi, f. 3. RÖHL. ann. Wett. Ges. iii, 231 (1814); Deutsch. Fl. iii, 69 (1813). BRID. Bry. univ. ii, 117 (1827). BR. SCHIMP. Bry. Eur. iv, Mon. 5, t. 7 (1844); Syn. musc. Eur. 438 (1860), et 2 ed. 534 (1876). WILS. Bry. Brit. 206, t. xi (1855). BERK. Hand. Br. m. 210, t. 19, f. 1 (1863). MILDE Bry. Siles. 248 (1869). DE NOT. Epil. Briol. Ital. 340 (1869). HOBK. Syn. br. m. 101 (1873). HUSN. Mouss. Nord-ouest 134 (1873).

Pol. intermedium BRID. Sp. musc. i, 70 (1806).

Pog. intermedium RÖHL. Deutsch. Fl. 2 ed. iii, 60 (1813).

Pol. semidiaphanum BRID. Mant. musc. 200 (1819).

Pog. nanum β. semidiaphanum BRID. Bry. univ. ii, 119.

Pog. subrotundum LINDB. in HARTM. Skand. Fl. 9 ed. ii, 44, inter synon. (1864).

Dioicous; laxly gregarious. Stems very short, simple, naked at base; leaves crowded, embracing the stem, patulous, olivaceous-green,

linear-lingulate, obtuse, margin erect and remotely denticulate above, convex at back and obscurely muricate below apex; when dry adpresso-incurved; lamellæ about 36, subundulate, rather high and somewhat distant, each in section of 6—8 small, equal rounded cells. Seta purple, often flexuose; capsule ovato-globose, erect or inclined, pale olive, turbinate when dry and contracted below the wide mouth; lid convex, protuberant, rostellate; teeth 32, linear, obtuse, hyaline with a purple median line. Calyptra cucullate, rufescent, scarce covering all capsule. Columella cylindric.

Male infl. cyathiform, inner bracts obovato-lanceolate, the nerve thin, with a few lamellæ at apex.

HAB.—By roadsides, on sandy places on heaths and banks in woods. Not uncommon, but much less frequent than the next species. Fr. 11—2.

Var. β. **Longisetum** (*Hampe*) *Lindb.*

Leaves longer, more linear. Seta much elongated; capsule oval-oblong.

SYN.—*Pol. nanum var. β. longisetum* HAMPE MSS. C. MUELL. Synops. i, 204.

Pogon. nanum var. β. longisetum BR. SCH. Bry. eur. mon. 5, t. 7, f. β.

Pol. subrotundum var. β. *longisetum* LINDB. op. cit. 143.

HAB.—Near Virginia water, with the ordinary form (*Braithwaite*, 1868)!! Near Penzance (*Curnow*)! Bickleigh down (*Holmes*), Yanaton down, Devon (*Brent*).

Several forms of this moss occur, one of which with linear, shorter, eroso-denticulate leaves is the *P. pumilum* SWARTZ and other old authors; and *P. semidiaphanum* BRID. only differs in the broader border of the leaf being pale and thus more transparent; *P. subrotundum* was also kept distinct from *P. nanum* for a state in which the leaf was almost entire. In this species alone, the inner membrane of the sporangium is in contact with the columella, the cylindric form of which is evident by a transverse section of the capsule, and is thus useful to distinguish this species from the next, in such a dubious form as the var. *longisetum*.

2. POLYTRICHUM ALOIDES *Hedw.*

Dioicous; stem short, simple or innovating. Leaves sheathing, broadly lanceolate, subacute, sharply serrate at margin and back of nerve. Capsule erect, oblongo-cylindric, lid conico-rostellate; columella 4-winged. (T. VI, B.)

SYN.—*Polytrichum parvum, Aloës folio serrato, capsulis oblongis* DILL. Hist. musc. 429, t. 55, f. 7 (1741) et Herb.

Mnium polytrichoides var. β. L. Sp. pl. ii, 1112 (1753).

Ditto var. longifructum Ehrh. in Hann, mag. 1780, 236.

Pol. subrotundum var. β. HUDS. Fl. angl. 400 (1762).

Pol. nanum WEISS Fl. gott. 173 (1770). LIGHTF. Fl. Scot. ii, 701 (1777). HUDS. op. cit. 2 ed. 470 (1778). Sw. meth. musc. 26, p.p. (1781). LINDB. in not. ur Sällsk. Fn. et. Fl. fenn. förh. ix, 139 (1867). Var. β. LEYSS. Fl. hal. 2 ed. 263 (1783).

Pol. mnioides NECK. Meth. musc. 123 (1771).

Pol. aloefolium 1 et 2 SCOP. Fl. carn. 2 ed. ii, 309 (1772).

Pol. aloides HEDW. St. crypt. i, 37, t. xiv (1787); Sp. Musc. 96 (1801). WILLD. Fl. berol. n. 914 (1787). ROTH Fl. germ. i, 458, et iii, 332 (1788). TIMM Fl. meg. n. 772 (1788). SIBTH. Fl. Oxon. 307 (1794). WITH. Bot. arr. Br. Veg. 3 ed., iii, 796 (1796). HOFFM. Deut. Fl. ii, 24 (1796). SWARTZ musc. suec. 78 (1798). MENZ. in Tr. Lin. soc. iv, 70 (1798). BRID. musc. rec. ii, P. I, 72 (1798); Sp. musc. i, 72 (1806); Mant. musc. 200 (1819). HULL Br. Fl. P. 2, 247 (1799). HOPPE Bot. Tasch. 155 (1800). RÖHL. Moosg. Deutsch. 192 (1800). SM. Fl. Brit. iii, 1380 (1804); Eng. Bot. t. 1649. TURN. Musc. hib. 88 (1804). SCHULTZ Fl. Starg. 287 (1806). WEB. MOHR Bot. Tasch. 226 (1807). VOIT musc. herb. 60 (1812). WAHLEN. Fl. carp. 349 (1814). SCHWAEGR. Suppl. I, P. 2, 322 (1816). HOOK. TAYL. musc. brit. 28, t. xi (1818). HOOK. Fl. scot. P. 2, 126 (1821); Brit. Fl. ii, 50 (1833). GRAY Nat. arr. Br. Veg. i, 721 (1821). ZENK. DIETR. musc. Thuring. n. 32 (1822). WALLR. Fl. crypt. germ. i, 197 (1831). HUEBEN. musc. germ. 522 (1833). BALS. DE NOT. Pr. Bry. Mediol. 22 (1833). MACK. Fl. hib. P. 2, 28 (1836). DE NOT. Syll. musc. n. 211 (1838). FIOR. MAZ. Bry. rom. 2 ed. 30 (1841). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 235 (1848). C. MUELL. Syn. musc. i, 202 (1849).

Pol. rubellum MENZ. in Tr. Lin. Soc. iv, 79, t. vii, f. 3 (1798). HULL Br. Fl. P. 2, 248 (1799). SMITH Fl. Brit. iii, 1381 (1804); Eng. Bot. t. 1939. BRID. Sp. musc. I, 73 (1806), et Mant. musc. 201 (1819).

Pogonatum aloides P. BEAUV. Prodr. 84 (1805). RÖHL. Deuts. Fl. iii, 60 (1813); Ann. Wett. Ges. iii, 229 (1814). BRID. Bry. univ. ii, 119 (1827). BR. SCHIMP. Bry. Eur. iv, Mon. 6, t. 8 (1844); Syn. musc. 439 (1860), et 2 ed. 535 (1876). WILS. Bry. Brit. 206, t. xi (1855). BERK. Handb. Br. m. 210, t. 19, f. 2 (1863). MILDE Bry. Siles. 248 (1869). DE NOT. Epil. Briol. Ital. 339 (1869). HOBK. Syn. Br. M. 102 (1873). HUSN. Mous. du Nord-ouest 135 (1873).

Dioicous; gregarious or clustered. Stem from a creeping base, erect, simple, naked below, sometimes bifid and elongated. Leaves crowded, patulous, dull green, lowest scale-like, ovate, the rest gradually longer as they ascend, from a sheathing, submembranous base, elongato-lanceolate, rather acute, distinctly serrate above and on the back of the nerve, contracted and appressed when dry; lamellæ about 48, low, straight, each in section of one row of 3—5 small, equal, rounded cells. Seta purple. Capsule somewhat contracted at base, oblong-urceolate, erect or inclined, olivaceous, with a red mouth, finally brown, granulose toward base; lid conic, rostellate; columella 4-winged; teeth 32, linear, pale; spores pale green. Calyptra longer than capsule, whitish, tinged with ferruginous below.

Male infl. discoid, inner bracts obovate, pointed, with some lamellæ at apex.

HAB.—Heaths, hollow banks and by the side of paths in woods. Common. Fr. 11—2.

Var. *β.* **Dicksoni** (*Turn.*) *Wallm.*

Dwarf, stem simple or branched; seta very short, capsule subobovate, lid conical, calyptra sometimes confluent below the capsule, sometimes perforated at apex.

SYN.—*Polyt. nanum* HOFFM. Deutsch. Fl. ii, 24. in obs. (1795).

Pol. Dicksoni TURN. Musc. Hib. 90, t. x, f. 2. Eng. Bot. t. 1605 (1804). BRID. Sp. musc. 71 et Mant. musc. 201.

Pol. aloides nanum WEB. M. Bot. Tasch. 227, in obs. var. *β. Dicksoni* WALLM. in LILJEBL. Svensk Fl. 3 ed. 528 (1816). HOOK. TAY. Musc. Br. 28.

Pol. minimum CROME in HOPP. Bot. Tasch. 1807, 108: et Samml. n. 30.

Pol. laterale CROME op. c. 111, et. Samml. ii, 89.

Pol. defluens BRID. Mant. musc. 200.

Pog. aloides var. γ. *defluens*, BRID. Bry. univ. ii, 121. C. MUELL. Syn. i, 203. SCHIMP. Synops. Musc. Var. β. *minus* Bry. eur. Bry. brit. BERK. Handb.

HAB.—On dry banks. Not common.

Near Yarmouth (*Dickson*). Derry, Ireland (*D. Brown*). Hopton, Suffolk (*Turner* 1802). Banks of Tay, Glebe of Kenmore (Herb. Hook)! Strome Ferry (*Hunt*, 1866)!! Madron, Penzance (*Curnow*). Compton and Moretonhampstead (*Brent*).

This species should strictly bear the name of *P. nanum*, having been so called and clearly defined by WEISS in 1770 in his excellent "*Pl. crypt. Fl. gotting;*" but seeing that later authors have transferred the name to the preceding species, it would lead to endless confusion to retain it. The plant is taller and more branching than *P. subrotundum*, and like it presents several different forms, the serration varying in extent, and size of teeth and sometimes being nearly obsolete on the back of the nerve; in *P. rubellum* MENZ. it is very distinct, and the stems also are taller and more branched. Occasionally both stems and setæ become greatly elongated, a state which appears to be frequent in N. India and Japan.

SECT. 2. *POGONATUM* P. BEAUV.

Stems taller, simple or branched, leafy throughout; leaves narrower, lanceolate, acute. Capsule as in Sect. 1.

3. POLYTRICHUM URNIGERUM *L.*

Dioicous; glaucescent, branched above. Leaves from a short, sheathing base, lanceolate, acute, sharply serrated. Capsule erect, ovali-cylindric, narrowed in the middle, papillose; lid convex, rostrate. (T. VI, C.)

SYN.—*Polytrichum ramosum, setis ex alis urnigeris* DILL. Hist. musc. 427, t. 55, f. 5 (1741) et Herb.

Pol. urnigerum L. Sp. pl. ii, 1109, n. 3 (1753); et Fl. suec. 967. HUDS. Fl. angl. 400 (1762). OEDER Fl. Dan. t. 296. NECK. meth. musc. 129 (1771). WITHER. Bot. arr. Br. veg. 663 (1776). LIGHTF. Fl. Scot. ii, 703 (1777). WEB. Fl. Gott. n. 119 (1778). ROTH Fl. germ. i. 457, et iii, 350 (1788). EHRH. Hann. mag. 235 (1780). HOFFM. Deutsch. Fl. ii, 24 (1796). MENZ. Tr. Lin. soc. iv, 81 (1798). BRID. Musc. rec. ii, P. I, 97 (1798); Sp. musc. I, 65 (1806); Mant. musc. 199 (1819). SWARTZ musc. suec. 77 (1798). HULL Br. Fl. P. 2, 248 (1799). RÖHL. Moosg. Deutsch. 210 (1800). HOPPE Bot. Tasch. 154 (1800). HEDW. Sp. musc. 100, t. 22, f. 5-7 (1801). SM. Fl. Brit. iii, 1378 (1804); Eng. Bot. 1218. TURN. Musc. hib. 87 (1804). WEB. MOHR Bot. Tasch. 216 (1807). WAHL. Fl. lapp. 347 (1812); Fl. carp. 349 (1814). VOIT Musc. herb. 60 (1812). SCHWAEGR. Suppl. I, P. 2, 318 (1816). MART. Fl. cr. erlang. 81 (1817). HOOK. TAYL. Musc. brit. 27, t. xi (1818). HARTM. Skand Fl. 286 (1820). FUNCK Moostasch. 70, t, 57 (1821). HOOK. Fl. Scot. P. 2, 126 (1821); Brit. Fl. ii, 50 (1833). GRAY Nat. arr. Br. pl. i, 721 (1821). ZENK. DIETR. Musc. Thur. n. 9 (1821). WALLR. Fl. crypt. germ. i, 197 (1831). HUEBEN. Musc. germ. 525 (1833). BALS. DE NOT. Pr. Bry. mediol. 21 (1834). MACK. Fl. hib. P. 2, 28 (1836). DE NOT. SYLL. musc. n. 210 (1838). FIOR. MAZ. Briol. rom. 2 ed. 30 (1841). RABENH. Deuts. Krypt. Fl. ii, P. 3, 236 (1848). C. MUELL. Syn. musc. i, 208 (1849). LINDB. in Not. ur Sällsk. Fl. Fn. fenn. ix, 134 (1867).

Bryum urnigerum NECK. Delic. gallo-belg. ii, 462 (1768).

Pol. dubium SCOP. Fl. carn. 2 ed. ii, 310 (1772).

Pol. axillare LAM. Fl. franc. i, 43 (1778).

Pol. pulverulentum REYN. in Act. Lausan. ii, P. 1, p. 11 (1780). RÖHL. op. cit. 216. BRID. Musc. rec., Sp. musc. et Mant. SCHWAEGR. op. c. 322.

Pol. fasciculatum MICHX. Fl. bor.-amer. ii, 294 (1803). BRID. Sp. musc. 64.

Pogonatum pulverulentum P. BEAUV. Prodr. 84 (1805).

Pog. fasciculatum P. BEAUV. op. cit. 84.

Pog. urnigerum P. BEAUV. op. cit. 85. RÖHL. Deutsch. Fl. iii, 60 (1813); Ann. Wett. ges. iii, 228 (1814). BRID. Bry. univ. ii, 124 (1827). BR. SCHIMP. Bry. eur. iv, Mon. 8, t. 9 (1844); Syn. musc. 440 (1860), et 2 ed. 537 (1876). WILS. Bry. Brit. 208, t. xi (1855). BERK. Handb. Br. m. 211 (1863). MILDE Bry. siles. 249 (1869). DE NOT. Epil. Briol. Ital. 338 (1809). HUSN. Mouss. Nord-ouest 135 (1873). HOBK. Syn. br. m. 102 (1873).

Dioicous; pale glaucous green above, ferruginous brown below; in wide lax patches. Stem erect 1—3 in. high, rigid, innovating laterally and more or less fasciculate. Lower leaves minute, scale-like, cuspidate, upper crowded, coriaceous, patent when moist, straight and incumbent when dry, from a shortly sheathing base, broadly lineal-lanceolate, very acute, nearly plane, margin serrate throughout with solid acute teeth, also slightly serrate at back of apex; lamellæ dense, low, straight, about 48, each in section of one row of 4—5 cells, the marginal larger, round, incrassate, papillose on the surface. Perichætial bracts narrow, subulate, with long sheathing bases. Seta longish, reddish yellow. Calyptra yellow-brown, prolonged below capsule. Capsule nearly erect, ovate-oblong, cylindraceous, somewhat contracted below the mouth, pachydermous, rufous brown, papillose with ascending conical granules, without stomata; lid convex with a straight subulate beak. Peristome from a broadish orange basal membrane, teeth 32, equal, rufous, rather short. Spores smooth. Male plants shorter and more slender, bracts very broad, obovate, with a short point.

HAB.—On banks and by streams in subalpine districts, not uncommon. Fr. 11—1.

Var. *β.* **Humile** *Wahlenb.*

Stem short, simple; leaves shorter, straight. Capsule narrower, ovate, subcernuous, on a shorter seta.

SYN.—*Pol. urnigerum* var. *β. humile* WAHLENB. Fl. lapp. 347 (1812). BRID. Mant. musc. 199; Bry. univ. ii, 126. SCHIMP. Syn. musc. 440, et 2 ed. 537.

HAB.—Dry stony places on moorlands.

This species varies somewhat in size and colour, and the capsules occasionally are a little asymmetric; the papillæ extend over the lower part of the lid.

4. POLYTRICHUM ALPINUM *L.*

Dioicous; stem tall, fasciculate-branched. Leaves longly sheathing, lineal-lanceolate, sharply serrate, spinulose at back. Capsule sub-

cernuous, tumid, ovate; lid obliquely rostrate; peristome short, irregular. (T. VI, D.)

SYN.—*Polytrichum alpinum ramosum, capsulis e summitate ellipticis* DILL. Hist. musc. 427, t. 55, f. 4 (1741) et Herb.

Pol. alpinum L. Sp. pl. ii, 1109, n. 2 (1753); Syst. nat. ii, 700. NECK. meth. musc. 120 (1771). WITHER. Bot. arr. Br. Veg. ii, 663 (1776). LIGHTF. Fl. Scot. ii, 703 (1777). WEBER Fl. gott. 40 (1778). HUDS. Fl. Angl. 2 ed., ii, 470 (1778). ROTH Fl. Germ. i, 457 (1788), et iii, 349. BRID. Musc. rec. ii, P. I, 99 (1792); Sp. musc. I, 62 (1806); Mant. musc. 198 (1819). HOFFM. Deuts. Fl. ii, 24 (1796). MENZ. Tr. Lin. Soc. iv, 83 (1798). SWARTZ musc. suec. 76 (1798). HULL Br. Fl. P. 2, 248 (1799). HOPPE Bot. Tasch. 153 (1800). HEDW. Sp. musc. 92, t. 19, f. 2–6 (1801). SMITH Fl. brit. iii, 1377 (1804); Eng. Bot. t. 1905. TURN. Musc. hib. 85 (1804). P. BEAUV. Prodr. 85 (1805). LAM. DE C. Fl. franc. 3 ed. ii, 490 (1805). WEB. MOHR Bot. Tasch. 225 (1807). Fl. Dan. t. 1362. WAHLENB. Fl. lapp. 346 (1812); Fl. carp. 348 (1814). HARTM. Skand. Fl. 286. SCHWAEGR. Suppl. I, P. 2, 307 (1816). HOOK. TAYL. Musc. brit. 27, t. xi (1818). HOOK. Fl. Scot. P. 2, 126 (1821); Brit. Fl. ii, 50 (1833). FUNCK Moostasch. 69, t. 57 (1821). GRAY Nat. arr. Br. pl. i, 721 (1821). WALLR. Fl. crypt. germ. i, 198 (1831). HUEBEN. Musc. germ. 527 (1833). MACKAY Fl. Hib. P. 2, 28 (1836). DE NOT. Syll. musc. n. 209 (1838). FIOR. MAZ. Briol. rom. 2 ed. 29 (1841). RABENH. Deuts. Krypt. Fl. ii, P. 3, 236 (1848). C. MUELL. Syn. musc. i, 210 (1849). LINDB. op. c. 129 (1867).

Pol. urnigerum var. *β.* HUDS. Fl. Angl. 400 (1762).

Pol. ferrugineum BRID. Sp. musc. i, 61 (1806).

Pogonatum alpinum RÖHL. Deutschl. Fl. 2 ed. iii, 59 (1813); et in Ann. Wetter. Ges. iii, 226 (1814). BRID. Bry. univ. ii, 129 (1827). BR. SCHIMP. Bry. Eur. iv, Mon. 9, t. x (1844); Syn. musc. 441 (1860), et 2 ed. 538 (1876). WILS. Bry. Brit. 208, t. xi (1855). BERK. Handb. Br. m. 211 (1863). MILDE Bry. Siles. 249 (1869). DE NOT. Epil. Briol. Ital. 338 (1869). HOBK. Syn. Br. m. 102 (1873).

Pol. furcatum HORNSCH. in N. ESEN. Hor. phys. berol. 67 (1820).

Pog. furcatum BRID. Bry. un. ii, 133 (1827).

Dioicous; laxly and irregularly cæspitose, deep green, rufous brown when old. Stem rooting only at base, trigonous, slender, erect or ascending, 2—4 in. high, dichotomous and fasciculate-branched. Leaves below scale-like, scariose, aristate with the excurrent nerve, upper gradually longer, from a whitish, glossy, long sheathing base, patulous, recurved or subsecund, when dry erecto-appressed, with the margin inflexed, long, lineal-lanceolate, cuspidate, concave, sharply serrate, spinulose and reddish at back towards apex; lamellæ about 32, higher, each in section of one row of 4—7 rounded cells, the marginal larger, ovate, incrassate, papillulose on the surface. Seta long, flexuose, orange. Calyptra shorter than capsule, fulvous brown. Capsule obliquely inclined, turgidly ovate or subgibbose—oblong, with a short neck bearing stomata, leptodermous, smooth, at first greenish-yellow with the mouth red, afterwards olive brown or black when old; lid small, conoid, with a subulate oblique beak; teeth of peristome yellow, short and very irregular; spores punctulate. Male plants shorter and more slender, scarce; bracts obovate, pointed.

HAB.—Rough stony and grassy places on all our mountains, descending to the lower moorlands in a dwarf form. Fr. 7—8.

This pretty moss may be readily known by its branching stems and tumid, pale, oblique capsule. Several well-marked varieties have been met

with on the higher mountains and in northern Europe, one of which Var. *silvaticum* (MENZ.) is probably a native of Scotland, and is chiefly distinguished by its narrower oblong, subincurved capsules. Another, Var. *septentrionale* (SW.) LINDB. is incorrectly referred by Hooker and Wilson to *P. sexangulare*, misled apparently by specimens so called in Herb. Turn., Swartz described his *P. septentrionale* with "leaves acute at apex, serrulate," and it must be referred to *P. alpinum*, as is well shown by Lindberg.

SECT. 3. *EUPOLYTRICHUM* C. MUELL.

Stems taller; leaves lanceolate, acute. Capsule with 2—6 angles.

5. POLYTRICHUM SEXANGULARE *Flörke.*

Dioicous; simple, erect. Leaves linear-lanceolate, obtuse, with the margin inflexed and quite entire. Capsule ovate, 5—6 angled; lid rostrate. (T. VII, A.)

SYN.—*Polytrichum sexangulare* FLOERKE in HOPP. Bot. Taschenb. 1800, pp. 43 et 150, n. 4. STURM Deutschl. Fl. ii, 4 (1800). WEB. MOHR Bot. Tasch. 220 (1807). BRID. Sp. musc. II, 52 (1812); Mant. musc. 196 (1819); Bry. univ. ii, 145 (1827). RÖHL. Deutsch. Fl. iii, 58; Ann. Wett. Ges. iii, 218 (1814). FUNCK Moostasch. 68, t. 54 (1821). WALLR. Fl. crypt. germ. i, 199 (1831). BR. SCHIMP. Bry. Eur. iv, mon. 7, t.11 (1844); Syn. Musc. 443 (1860); et 2 ed. 540 (1876). WILS. Bryol. brit. 209, t. 10, fig. g (1855). HARTM. Skand. Fl. 8 ed. 373, p.p. (1861). BERK. Handb. Br. m. 207, t. 18, f. 6 (1863). MILDE Bry. Siles. 251 (1869). DE NOT. Epil. Briol. Ital. 333 (1869). HOBK. Syn. br. m. 102 (1873).

Pol. crassisetum LAM. DE C. Fl. franc. 3 ed. ii, 486 (1805), et v, 224 (1815).

Pol. septentrionale (non SWTZ.) P. BEAUV. Prodr. 86 (1805)? Eng Bot. t. 1906 (1808). SCHWAEG. Suppl. I, P. II, 313, excl. syn. (1816); et in L. Sp. pl. 5 ed. v, P. II, p. 5 excl. syn. (1830). WALLM. in LILJEBL. Svensk fl. 3 ed. 527, p.p. (1816). HOOK. TAYL. Musc. br. 25, t. x, p.p. (1818). HOOK. Fl. Scot. P. 2, 126 (1821); Brit. Fl. ii, 49 (1833). SOMM. Suppl. Fl. lapp. 55, p.p. (1826). HUEBEN. Musc. germ. 528, excl. syn. (1833). DE NOT. Syll. musc. Ital. 160 (1838). C. MUELL. Syn. musc. i, 223, excl. syn. (1848); et Deutsch. moos. 171, excl. syn. (1853). RABEN. Deutschl. Krypt. Fl. ii, P. III, 237, p.p. (1848).

Pol. helveticum SCHLEICH. cent. III, n. 16 (1815).

Dioicous; widely cæspitose, deep green above, rufo-ferruginous below, without radicular tomentum. Stem naked at base, rigid, flexuose, 2—5 in. high, simple, erect, or decumbent. Leaves short, gradually elongating as they ascend, incurvo-patent or secund, when dry laxly incumbent, from a broad base, suddenly elongato-lanceolate, quite entire, glossy, rigid, semiterete, rather obtuse, smooth at back, margin thin, papery, inflexed; lamellæ high, about 32, each in section of 4—6 cells, the marginal one larger, incrassate, ovate, smooth. Perich. bracts longer, with longer sheaths. Seta bright red, thick. Calyptra reaching middle of capsule, brownish. Capsule erect or inclined, ovate with 6 obtuse angles, reddish brown, when dry hexagono-prismatic, pachydermous; hypophysis obconic, not well defined; lid from a

convex-conic reddish base, with a thick yellowish oblique beak. Peristome of 64 short unequal teeth, pale with an orange median line. Epicarpic membrane minutely quadrate-areolate, with some minute stomata below.

Male plants intermixed; bracts subquadrate, pointed, the nerve with a few lamellæ at apex, paraphyses spathulate.

HAB.—Wet hollows on the higher Scotch mountains. Fr. 8—9.

Ben Nevis, Ben Macdhui and others of the Cairngorm range, fruiting sparingly. Ben Lawers, barren.

Schwaegrichen, Aongstroem and the British bryologists refer this species to *P. septentrionale* SWARTZ, which appears without doubt to be only a variety of *P. alpinum* that has been confounded with it; (see Bridel Bry. univ. ii, pp. 132 et 146 for a clear exposition of the subject).

6. **POLYTRICHUM GRACILE** *Dicks.*

Dioicous; densely cæspitose. Leaves shorter, lineal-lanceolate, the wings thin, pellucid, erect, sharply serrate. Capsule ovate, obscurely 6-angled, narrowed at mouth; lid large, with a long slightly obliquate beak. (T. VII, B.)

SYN.—*Polytrichum gracile* DICKS. MSS. MENZ. in Trans. Lin. Soc. iv, 73, t. 6, fig. 3 (1798). HULL Br. Flor. P. 2, 247 (1799). SMITH Fl. Brit. iii, 1374 (1804); Eng. Bot. t. 1827. TURN. musc. Hib. 85 (1804). WEB. MOHR Bot. Tasch. 222 (1807). MART. Fl. crypt. Erl. 83 (1817). SCHWAEGR. Suppl. II, 167, t. 148 (1824). BRID. Bry. univ. ii, 154 (1827). WALLR. Fl. crypt. germ. i, 201 (1831). HUEBEN. Musc. germ. 530 (1833). DE NOT. Syll. musc. n. 208 (1838). BR. SCHIMP. Bry. Eur. iv, Mon. 10, t. xii (1844); Syn. musc. 444 (1860), et 2 ed. 540 (1876). C. MUELL. Syn. musc. i, 225 (1849). WILS. Bry. Brit. 210, t. 46 (1855). BERK. Handb. Br. m. 208 (1863). LINDB. in Not. ur Sälls. Fn. et Fl. fenn. förh. ix, 127 (1867). DE NOT. Epil. Briol. Ital. 332 (1869). MILDE Bry. Siles. 250 (1869). HUSN. Mouss. nord-ouest 137 (1873). HOBK. Syn. br. m. 103 (1873).

Pol. longisetum SWTZ. Disp. musc. Suec. 76, n. 4, et 103, n. 16, t. 8, f. 16 (1799). BRID. Sp. Musc. I, 59 (1806); Mant. musc. 197 (1819). SCHULTZ Fl. Starg. 286 (1806). ROEHL. Deutsch. Fl. iii, 69, et in Ann. Wett. Ges. iii, 220 (1814). SCHWAEGR. Suppl. I, P. II, 316 (1816). FUNCK Moostasch. 69, t. 56 (1821).

Pol. aurantiacum HOPPE Bot. Tasch. 1800, pp. 139 et 151. WAHLENB. Fl. Lapp. 345 (1812).

Pol. marginatum WAHL. MSS. WEB. MOHR Ind. mus. pl. crypt. (1803). BRID. Sp. musc. i, 59 (1806). SCHWAEGR. Suppl. I, P. II, 329, n. 24, p.p. (1816).

Pol. attenuatum var. β. *aurantiacum* TURN. Musc. hib. 84 (1804).

Pol. nigrescens LAM. DEC. Fl. franc. 3 ed. ii, 490 (1805).

Pol. commune var. β. *attenuatum* HOOK. TAYL. Musc. brit. 26, p.p. (1818). Var. β. *aurantiacum* WAHLENB. Fl. suec. ii, 737, p.p. (1826).

Pol. formosum var. β. *aurantiacum* HARTM. Skand Fl. 404 (1820).

Dioicous; densely cæspitose, cohering by radicular tomentum. Stems 1—4 in. high, erect, slender, simple, dividing from a strongly flexuose and tomentose base. Leaves sub-erect, shorter, dark green, from a sheathing base, somewhat channelled, lineal-lanceolate, with a short brown point, the wings thin, pellucid, erect, sharply serrate, rough at back of apex; lamellæ abount 42, higher, each in section

of 4—6 cells, all equal and smooth. Perich. bracts sheathing up to middle, narrowly subulate. Capsule on a long orange seta, erect, when dry horizontal, not quite covered by the orange calyptra, ovate with 6 obscure angles, narrowed at mouth, yellow, leptodermous, with an obconic not very distinct hypophysis; lid large, red bordered, with a long slightly obliquate beak. Teeth 32, united in pairs, or 64, unequal, varying in length. Spores rather large, pale ferruginous. Male plants with shorter leaves; bracts obovate, acuminate.

HAB.—Dry heaths on turfy soil, sides of peat cuttings and sometimes in clefts of rocks. Not uncommon. Fr. 7.

Ben Nevis (*Dickson*). Oakmere and Knutsford moor (*Wilson*)! Halemoss, Cheshire (*Hunt*)!! Ingleboro (*Hooker*). Todmorden (*Nowell*). Chyandour moor, Penzance (*Curnow*). Trowlsworthy bog (*Brent*).

Resembles *P. attenuatum* but is smaller and more slender, the leaves shorter, with cells twice the size, and with broad pellucid margins, and differing also by the obtuse-angled capsule and beaked lid. The latter characters will also distinguish it from *P. commune* var. *minus*.

7. POLYTRICHUM ATTENUATUM *Menz.*

Dioicous; tall, cæspitose. Leaves from a glossy sheathing base, arcuato-patulous, lineal-lanceolate, plane; margin sharply serrate. Capsule prismatic, with 6 (sometimes 4 or 5) angles, pale, leptodermous; lid from a broad base, conico-acuminate. (T. VII, C.)

SYN.—*Polytrichum attenuatum* MENZ. in Trans. Lin. Soc. iv, 72, t. 6, fig. 2 (1798). SMITH Eng. Bot. t. 1198 (1803), et Fl. brit. iii, 1373 (1804). TURN. Musc. hib. 83 (1804). LINDB. in Not. ur. Sälls. Fn. et Fl. fenn. förh. ix, 126 (1867).

Pol. formosum HEDW. Sp. musc. 92, t. 19, fig. 1 et a. (1801). P. BEAUV. Prodr. 85 (1805). BRID. Sp. musc. I, 55 (1806); Mant. musc. 197 (1819); Bry. univ. ii, 151 (1827). WEB. MOHR Bot. Tasch. 221 (1807). WAHLENB. Fl. lapp. 345 (1812); Fl. carp. 348 (1814). ROEHL. Deuts. Fl. iii, 58, et. in Ann. Wett. Ges. iii, 219 (1814). SCHWAEGR. Suppl. I, P. II, 315 (1816). MART. Fl. crypt. Erl. 83 (1817). SCHULTZ Suppl. Fl. Starg. 87 (1819). FUNCK Moostasch. 69, t. 55 (1821). WALLR. Fl. crypt. germ. i, 200 (1831). HUEBEN. Musc. germ. 536 (1833). BALS. DE NOT. Pr. Bry. med. 20 (1834). DE NOT. Syll. musc. n. 207 (1838). FIOR. MAZ. Briol. rom. 2 ed. 29 (1841). Br. SCHIMP. Bry. Eur. iv, Mon. 9, t. xii (1844); Syn. Musc. 445 (1860), et 2 ed. 541 (1876). C. MUELL. Syn. musc. i, 224 (1849). WILS. Bry. Brit. 210, t. 46 (1855). BERK. Handb. Br. m. 208 (1863). MILDE Bry. Siles. 250 (1869). DE NOT. Epil. Briol. Ital. 331 (1869). HOBK. Syn. br. m. 103 (1873). HUSN. mouss. nord-ouest 136 (1873).

Pol. pallidisetum FUNCK in HOPP. Bot. Tasch. 1802, p. 44; Moostasch. 69, t. 55. BRID. Sp. musc. I, 58; Mant. musc. 197.

Pol. commune var. *β. attenuatum* HOOK. TAYL. Musc. brit. 26, p.p. (1818); Brit. Fl. ii, 49 (1833).—Var. *β. aurantiacum* WAHLENB. Fl. suec. ii, p. 737, p.p. (1826).

Pol. aurantiacum var. *β.* WAHLENB. Fl. upsal. 387 (1820).

Pol. formosum a. quadrangulare HARTM. Skand. Fl. 404 (1820).

Dioicous; tall, laxly cæspitose, bright green. Stem 3—6 in. high, simple, erect or ascending from a decumbent tomentose base. Lower leaves minute, membranous with a patent cuspidate point; upper from a glossy, longly sheathing whitish base, arcuato-patulous, when dry laxly incumbent, longly lineal-lanceolate, plane, opake, margin erect,

sharply serrate to base; lamellæ very low and close, about 60, each in section of a row of 3—4 cells, equal in size and smooth. Perich. bracts very long, erect, with long sheaths, lamellose only toward apex. Seta long, reddish yellow. Calyptra covering all capsule, fulvous brown. Capsule erect when moist, cernuous when dry, finally horizontal, prismatic with 6—rarely 5 or 4—angles, and an obconic rather indistinct hypophysis, pale yellow green, finally fawn-colored, leptodermous; lid from a broad base with a purple margin, conico-acuminate. Teeth 64, pale yellow, short. Spores very small, dark yellow. Male plants shorter and more slender, bracts cuspidate.

HAB.—Dry woods in subalpine districts. Common in the north. Fr. 6—7.

This species is at first sight often mistaken for *P. commune*, but is a more delicate plant, easily distinguished by its soft, less quadrangular capsule, without a distinct perichætium.

P. pallidisetum is only a form with shorter stems, straighter leaves, and narrower and longer capsule.

8. POLYTRICHUM PILIFERUM *Schreb.*

Dioicous; laxly cæspitose. Stems short, simple, naked below, densely comoso-leafy above; leaves elongato-lanceolate, wings inflexed, entire, nerve prolonged into a rough hoary hair-point. Capsule tetragonous; lid depresso-conic, rostellate. (T. VIII, A.)

SYN.—*Muscus trichoides minor foliis oblongis*, &c. RAY Synops. 2 ed. 29, n. 5 (1696).

Polytrichum quadrangulare minus, juniperi foliis pilosis DILL. Hist. musc. 426, t. 54, fig. 3 (1741) et Herb.

Pol. commune var. γ. L. Sp. Pl. ii, 1109 (1753). HUDS. Fl. angl. 400 (1762). WITHER. Arr. Br. Veg. ii, 662 (1776). Var. γ. *pilosum* WEISS Pl. cr. fl. gott. 172 (1770).

Pol. piliferum SCHREB. Spic. fl. lips. 74 (1771). BRID. Musc. rec. ii, P. I, 85 (1792); Sp. musc. I, 52 (1806); Mant. musc. 196 (1819); Bry. univ. ii, 142 (1827). SIBTH. Fl. Oxon. 306 (1794). HOFFM. Deuts. Fl. ii, 21 (1796). ROTH Fl. Germ. i, 457 et iii, 348. MENZ. Trans. Linn. Soc. iv, 75 (1798). SWARTZ Musc. suec. 76 (1798). HULL Br. Fl. P. 2, 247 (1799). RÖHL. Moosg. Deuts. 181 (1800); Deutsch. Fl. iii, 58 (1813); Ann. Wett. ges. iii, 217 (1814). HOPPE Bot. Tasch. 148 (1800). HEDW. Sp. musc. 90 (1801). SMITH Fl. Brit. iii, 1374 (1804); Eng. Bot. 1199. TURN. Musc. Hib. 82 (1804). P. BEAUV. Prodr. 86 (1805). LAM. DeC. Fl. franc. 3 ed. ii, 488 (1805). SCHULTZ Fl. Starg. 287 (1806). WEB. MOHR Bot. Tasch. 118 (1807). VOIT Musc. herb. 59 (1812). WAHLEN. Fl. Lapp. 243 (1812); Fl. carp. 347 (1814). SCHWAEGR. Suppl. I, P. 2, 313 (1816). MART. Fl. cr. Erlang. 82 (1817). HOOK. TAYL. Musc. Brit. 24, t. x (1818). HOOK. Fl. Scot. P. 2, 125 (1821); Brit. Fl. ii, 48 (1833). FUNCK Moostasch. 68, t. 54 (1821). WALLR. Fl. crypt. germ. i. 199 (1831). HUEBEN. Musc. germ. 524 (1833). BALS. DE NOT. Pr. Bry. mediol. 18 (1834). MACKAY Fl. Hib. P. 2, 27 (1836). BR. SCHIMP. Bry. Eur. iv, Mon. 11, t. xiv (1844); Syn. Musc. 446 (1860), et 2 ed. 542 (1876). C. MUELL. Syn. Musc. i, 217 (1849). WILS. Bry. Brit. 213, t. x (1855). BERK. Handb. Br. m. 208 (1863). LIND. Not ur Sälls. Fn. et Fl. fenn. ix, 124 (1867). MILDE Bry. Siles. 252 (1869). DE NOT. Epil. Briol. Ital. 335 (1869). HUSN. Mouss. nord-ouest 137 (1873). HOBK. Syn. br. m. 104 (1873).

Pol. pilosum NECK. Meth. musc. 123 (1771). SCHRANK Baiers. Fl. ii, 446 (1789).

Pol. commune β. *pilosum* EHRH. Hann. Mag. 235 (1780).

Pol. pilifolium GRAY Nat. arr. Br. pl. i, 720 (1821).

Dioicous; laxly cæspitose, glaucous green above, fuscescent below; rhizome subterranean, flexuose, branched and densely tomentose. Stems short, 1 in. high, erect, simple, naked below; lower leaves very small, ovate, appressed, upper suddenly larger, erecto-patent, when dry imbricated and forming a clavate penicillate head, from an ovate, coloured, sheathing base, elongato-lanceolate, the wings inflexed, connivent, entire, with wide rectangular areolation, the apex smooth at back; the nerve prolonged into a serrate hoary hair-like arista; lamellæ low, about 32, each in section of a row of 4—6 cells, the marginal one larger, with a large papilla at apex, and hence somewhat cruciate. Perich. bracts lineal-lingulate, erect, very concave, innermost thin, without lamellæ, all longly aristate. Seta purple. Calyptra reaching below capsule, fulvous with paler fringe. Capsule tetragono—ovate, erect, cernuous when dry, finally horizontal, pachydermous, pale brown; hypophysis narrow, conoid, purple; lid depresso—conic, shortly rostellate, orange or red. Teeth 64, shortish, regular, with an orange median line. Spores very small, ferruginous.

Male plants have leaves more lax, with shorter awns; inflor. rosy purple, orange or green, bracts obcordate, apiculate, lamellose at apex.

HAB.—On dry heaths; very common. Fr. 5—6.

Pol. Hoppei HORNSCH. is an alpine form with lingulate leaves, long very rough hair-points and cubic capsules. *Pol. hyperboreum* R. BR. appears to be a good species, confined to arctic Europe and America, having the leaf cells, three times the size of those of *P. piliferum* and the capsule leptodermous and flattened as in *P. commune*.

9. POLYTRICHUM JUNIPERINUM *Willd.*

Dioicous; gregarious, glaucescent. Leaves patulous and subrecurved, lineal-lanceolate, the wings inflexed, entire, nerve excurrent in a short reddish awn. Capsule tetragono-prismatic, pachydermous; lid plano-convex, rostellate. (T. VIII, B.)

SYN.—*Adiantum aureum pileolo villoso, medium* RAY Syn. Stirp. Br. 2 ed. 28 (1696).

Polytrichum montanum et minus, capsula qurdrangulari DILL. cat. giss. 221 (1719); et in RAY Syn. 3 ed. 90 (1724).

Pol. quadrangulare juniperi foliis brevioribus et rigidioribus DILL. Hist. Musc. 424, t. 54, f. 2 (1741).

Pol. commune var. *β.* L. Sp. Pl. ii, 1109, p.p. (1753). HUDS. Fl. Angl. 400 (1762). Var. *β. minus* WEISS Crypt. gott. 171, p.p. (1770). NECK. Meth. musc. 125 (1771). WITH. Bot. arr. Br. Veg. ii, 662 (1776). LIGHTF. 700 (1777). RELH. Fl. Cant. 397 (1785).

Pol. commune—juniperifolium EHRH. in Hann. Mag. 235 (1780).

Pol. juniperinum WILLD. Fl. berol. prodr. 305 (1787). ROTH. Fl. germ i, 457 (1788), et iii, 348. BRID. Musc. rec. ii, P. I, 83 (1792); Sp. musc. I, 47 (1806); Mant. musc. 194 (1819); Bry. univ. ii, 136 (1827). SIBTH. Fl. oxon. 306 (1794). ABBOT Fl. bedf. 232 (1798). MENZ. Tr. Linn. Soc. iv, 76, t. 6, f. 4 (1798). SWARTZ Musc. suec. 77 (1798). RÖHL. Moosg. Deuts. 170 (1800); Deutsch. fl. iii, 57 (1812); Ann. Wett. ges. iii, 215 (1814). HEDW. Sp. musc.

89, T. 18, f. 6—10 (1801). SMITH Fl. Brit. iii, 1375 (1804); Eng. Bot. 1200. TURN. Musc. Hib. 82 (1804). P. BEAUV. Prodr. 352 (1805). LAM. DeC. Fl. franc. 3 ed. ii, 489 (1805). SCHULTZ Fl. Starg. 285 (1806). WAHLENB. Fl. lapp. 341 (1812); Fl. carp. 348 (1814). SCHWAEGR. Suppl. I, P. 2, 309 (1816). HOOK. TAYL. Musc. Brit. 27, t. x (1818). FUNCK Moostasch. 68, t. 54 (1821). HOOK. Fl. Scot. P. 2, 126 (1821) excl. syn., Brit. Fl. ii, 49 (1833). GREV. Mem. Wern. soc. iii, 436 (1821). GRAY Nat. arr. Br. pl. i, 720 (1821). WALLR. Fl. crypt. germ. i, 200 (1831). HUEBEN. Musc. germ. 532 (1833). BALS. DE NOT. Pr. Bry. Med. 18 (1834). MACK. Fl. Hib., P. 2, 28 (1836). DE NOT. Syll. musc. n. 204 (1838). BR. SCHIMP. Bry. Eur. iv, Mon. 12, t. xv (1844); Syn. musc. 447 (1860), et 2 ed. 543 (1876). RABENH. Deutsch. Krypt. Fl. ii, P. 3, 238 (1848). C. MUELL. Syn. musc. i, 218 (1849). WILS. Bry. Brit. 213, t. x (1855). BERK. Handb. Br. m. 209, t. 18, f. 7 (1863). LINDB. in Not. ur Sälls. Fn. et Fl. fenn. förh. ix, 122 (1867). MILDE Bry. Siles 253 (1869). DE NOT. Epil. Briol. Ital. 334 (1869). HOBK. Syn. br. m. 104 (1873). HUSN. Mouss. nord-ouest 137 (1873).

Pol. juniperifolium HOFFM. Deutsch. Fl. ii, 24 (1795). HOPPE Journ. Bot. 146 (1800). WEB. MOHR Bot. Tasch., 219 (1807). MART. Fl. Cr. Erl. 82 (1817). ZENK. DIETR. Musc. Thuring. n. 10 (1821).

Pol. implicatum VOIT Musc. herbip. 59 (1812).

Dioicous; gregarious, glaucous green above, fuscescent below; rhizome flexuose, densely radiculose. Stem erect 1—6 in. high, rarely 2 or 3 partite. Leaves when moist patulous and subrecurved, when dry erect, the lower squamose, appressed, the upper long, lineal-lanceolate, semiterete-subulate, the wings inflexed, subconnivent, quite entire, nerve excurrent in a short reddish arista, muricate at back; lamellæ yellow-green, low, dense, about 48, each in section of a row of 4—6 cells, the marginal one larger, cruciform from having a tooth-like papilla at apex. Perich. bracts longer, convolute, membranous at margin, with a long rough arista. Capsule on a purple seta, entirely covered by the rufous calyptra, tetragono-prismatic, erect, pachydermous, rufous-orange, finally brown and horizontal, with a purple shield-like hypophysis; lid plano-convex, rostellate, rufous with a deep red margin. Teeth 64, rather short, pale yellowish.

Male plants intermixed, more slender, with shorter leaves; outer bracts ovate, strongly mucronate, innermost thin, truncate, pointed.

HAB.—Wet heaths and bare places in woods; not uncommon. Fr. 6—7.

This plant varies much in size and also in the colour of the calyptra, which at great elevations is sometimes quite white.

Dillenius by some mistake has figured the leaf as serrated, and the plant in his herbarium is *P. strictum* ♂.

10. POLYTRICHUM STRICTUM *Banks.*

Dioicous; resembling *P. juniperinum* but taller, and more slender with densely tomentose stems; the leaves shorter, erecto-patent, straight. Capsule small, cuboid. (T. VIII, C.)

SYN.—*Pol. strictum* BANKS MSS. MENZ. in Trans. Lin. Soc. iv. 77, t. 7, fig. 1 (1798). HULL Br. Fl. P. 2, 247 (1799). SMITH Fl. Brit. iii, 1376 (1804); Eng. Bot. t. 2435 (1812). TURN. Musc. hib. 83 (1804). LAM. DeC. Fl. gall. n. 1274 (1805). BRID. Sp. musc. I, 49

(1806); Mant. musc. 195 (1819), et Bry. univ. ii, 139 (1827). MILDE Bry. Siles. 253 (1869). HOBK. Syn. Br. m. 104 (1873). HUSN. Mouss. nord-ouest 137 (1873). SCHIMP. Syn. Musc. 448 (1860), et 2 ed. 544 (1876).

Pol. alpestre HOPPE Bot. Tasch. 198 (1801). BRID. Sp. musc, I, 50 (1806); Mant. musc. 195 (1819); Bry. univ. ii, 140 (1827). SCHWAEGR. Suppl. I, P. 2, 310 (1816). SCHULTZ Fl. Starg. Suppl. 88 (1819). WALLR. Fl. crypt. germ. i, 199 (1831). HUEBEN. Musc. germ. 533 (1833).

Pol. juniperinum var. WEB. MOHR Bot. Tasch., 220 (1807).—Var. A. *strictum* WALLM. in LILJEBL. Svensk Fl. 3 ed. 527 (1816).—Var. β. *gracilius* WAHLEN. Fl. lapp. 344 (1812).—Var. β. *strictum* HARTM. Skand. Fl. 404 (1820). C. MUELL Syn. musc. i, 218 (1849).—Var. β. *strictum* et γ. *alpestre* BR. SCHIMP. Br. Eur. iv, Mon. 12, t. 16 (1844). DE NOT. Epil. Briol. Ital. 334 (1869). WILS. BERK., &c. Var. β. *alpestre* HARTM. op. cit. 5 ed. 361 (1849). **P. strictum* LINDB. in Ofv. W. Ak. Förh. xxiii, 548 (1866), et NOT. ur Sällsk. Fn. et Fl. fenn. förh. ix, 123 (1867).

Dioicous; resembling *P. juniperinum*, pale glaucous green, slender, densely cæspitose, branched. Stems 3—12 in. high, interwoven by dense dirty white tomentum. Leaves erecto-patent, straight, imbricated when dry, shorter and narrower; lamellæ about 32, less developed. Capsule small, cubic, acutely angular, rufous orange. Calyptra brownish or whitish.

HAB.—Boggy heaths. Less frequent. Fr. 5—6.

Near Taymouth on tops of walls (*Menzies*). Forfar (*Don* 1802). Ben Lawers and Glen Callater (*Hunt*)!! Ben Vracky, Perth (*Boswell*)!! Herringfleet, Suffolk (*Turner* 1806). Scawfell and Witherslack (*Boswell*). Micklefell, Yorks. (*Baker*)!! Todmorden and Cliviger (*Nowell*). Knutsford moor and Wybunbury bog (*Wilson*).

Much as this differs in appearance from *P. juniperinum*, I confess to be more in accord with the authors who regarded it as a variety of that species, for it will be seen there are no structual differences between them. Lindberg calls it a subspecies of *P. juniperinum*, to which it stands in the same relation as *P. Swartzii* to *P. commune*.

11. POLYTRICHUM COMMUNE *L.*

Dioicous; very tall, simple. Leaves very long, patent recurved, linear-subulate, plane, spinuloso-serrate, scabrous at back. Capsule tetraedral, with a discoid hypophysis; lid depresso-convex, conico-rostellate. (T. IX.)

SYN.—*Polytrichum vulgare et majus, capsula quadrangulari* DILL. Cat. Giss. 221, App. 85 (1719), et in RAY Synops. 3 ed. 90, 1 (1724).

Polyt. quadrangulare vulgare, yuccæ foliis serratis DILL. Hist. musc. 420, 1, T. 54, fig. 1 (1741), et Herb.

Pol. commune a. L. Sp. Pl. ii, 1109, n. 1 (1753); Syst. Nat. ii, 700; Fl. suec. n, 966. HUDS. Fl. angl. 399 (1762). SCHREB. Spic. Fl. Lips. 73 (1771). NECK. Meth. musc. 124 (1771). WITH. Bot. arr. Br. veg. 662 (1776). LIGHTF. Fl. Scot. ii, 698 (1777). RELH. Fl. Cant. 396 (1785). WILLD. Pr. Fl. Berol. n. 900 (1787). SIBTH. Fl. Oxon. 305 (1794). ABBOT Fl. bedf. 232 (1798). HOFFM. Deutsch. Fl. ii, 23 (1796). MENZ. Tr. Linn. Soc. iv, 74 (1798); Roth. Fl. germ. i, 456 (1788), et iii, 346. SWARTZ Musc. suec. 75 (1798). BRID. Musc. rec. ii, P. I, 81 (1792); Sp. musc. I, 54 (1806); Mant. musc. 197 (1819); Bry. univ, ii, 148 (1827). RÖHL. Moosg. Deutsch. 170 (1800); Deutsch. Fl. iii, 58 (1813); Ann. Wett. ges. iii, 219 (1814). SMITH Fl. Brit. iii, 1372 (1804); Eng. Bot. 1197. TURN. Musc. Hib. 80 (1804). P. BEAUV. Prodr. 85 (1805). LAM. DEC. Fl. franc. 3 ed. ii, 487 (1805). SCHULTZ Fl. starg. 285 (1806). WAHLENB. Fl. lapp. 344 (1812); Fl. carp. 348 (1814). SCHWAEGR. Suppl. i, P. 2, 314 (1816). HOOK.

TAYL. Musc. Brit. 26, t. x (1818). FUNCK Moostasch. 69, t. 55 (1821). GRAY Nat. arr. Br. pl. i, 721 (1821). ZENK. DIETR. Musc. Thuring. n. 33 (1822). WALLR. Fl. crypt. germ. i, 201 (1831). HUEBEN. Musc. germ. 535 (1833). BALS. DE NOT. Pr. Bry. mediol. 18 (1834). DE NOT. Syll. mus. n. 206 (1838). BR. SCHIMP. Bry. Eur. iv, Mon. 13, t. xvii (1844); Syn. musc. 448 (1860); et 2 ed. 545 (1876). C. MUELL. Syn. musc. i, 220 (1849). WILS. Bry. Brit. 211, t. x (1855). BERK. Handb. Br. m. 209 (1863). MILDE Bry. Siles. 252 (1869). DE NOT. Epil. Bry. Ital. 329 (1869). HOBK. Syn. br. m. 103 (1873). HUSN. Mouss. nord-ouest 136 (1873).

Pol. commune α. *majus* WEISS Crypt. gotting. 168 (1770).

——————— α. *serrulatum* RETZ. Fl. Scand. ii. 209 (1779).

——————— α. *yuccæfolium* EHRH. in Hann. mag. 235 (1780). HOOK. TAYL. Musc. brit. 26, T. 10 (1818).

Pol. yuccæfolium EHRH. Pl. crypt. n. 214, et Beitr. vii, 101 (1792). WEB. MOHR Bot. Tasch. 221 (1807). VOIT Musc. herbip. 58 (1812). MART. Fl. cr. Erl. 83 (1817).

Pol. serratum SCHRANK Bayer. Fl, ii, 446 (1789); et Prim. fl. salisb. 223 (1792).

Pol. propinquum R. BR. in Parry Voyage, Suppl. 294 (1824).

Pol. quadrangulare GILIB.; e STEUD. Nomen. crypt. 353 (1824).

Dioicous; very tall, laxly cæspitose, in large deep green patches, rufescent below. Stem 6—18 in. high, flexile, trigonous, tomentose at base, simple, rarely forked. Lower leaves lax, scale-like, fulvous, shining, from an oblong base, subulato-setaceous, rough at apex, the upper very long, patenti-recurved or squarrose, erect and appressed when dry with the apex flexuose, from a sheathing, submembranous, glossy whitish base, linear-subulate, plane, the wings very narrow, densely spinuloso-serrate to the base, above scabrous at back; lamellæ with the margin thickened and grooved, occupying nearly all leaf, about 60, low, straight, each in section of a row of 4—6 cells, the marginal broader, incrassate, subquadrate, semilunar at top; perich. bracts erect, very long, sheathing, the internal membranous, the nerve without lamellæ, prolonged into a short bristle. Seta very long, orange-red. Calyptra extending below the capsule, ferruginous with a silky gloss. Capsule tetraedral, acute-angled, somewhat flattened horizontally, pachydermous, rufo-fuscous, at first erect, horizontal when dry and empty; hypophysis annular; lid from a depresso-convex base, conico-rostellate, rufous red at margin; teeth 64, small, rather broad, on a yellowish basal membrane. Spores very small, rufous.

Male plants shorter, less comose; the infl. discoid, repeatedly proliferous from the centre, bracts subcuneate-ovate, mucronate, denticulate, lamelligerous at apex; paraphyses very numerous and long, filiform and spathulate.

HAB.—Marshy places on turf-moors. Common. Fr. 6—7.

Var. β. **Perigoniale** (*Michx.*) *Br. Schp.*

Stem shorter, simple; inner perichætial bracts longer, quite entire; leaves nearly smooth at back.

SYN.—*Polytr. perigoniale* MICHX. Fl. bor.-amer. ii, 293 (1803). BRID. Sp. musc. 54; Mant. musc. 197; et Bry. univ. ii, 150.

Pol. yuccæfolium Var. β. perigoniale MART. Fl. crypt. erlang. 83 (1817).

Pol. commune α. campestre WALLR. Fl. crypt. Germ. i, 201 (1831).—Var. *β. campestre* HUEBEN. Musc. Germ. 535.—Var. *β. perigoniale* BR. SCHP. Br. Eur. iv, Mon. 13, t. 17, fig. *β.* et Syn. musc. WILS. Bry. Brit. 212. LINDB, op. c. 117.

HAB.—Drier places on moors.

Newchurch bog and Woolston moss (*Wilson*) !

Var. γ. **Minus** *Weiss.*

Plants shorter and more slender; leaves dense, shorter and more erect, perich. bracts less distinct. Capsules much smaller and shorter, less acutely quadrangular, lid with a short straight beak, calyptra pale golden brown.

SYN.—*Pol. commune* Auct. ant. p.p.—Var. *β.* L. Sp. pl. ii, 1109, p.p.—Var. *β. minus* WEISS Pl. crypt. gott. 171, p.p. LIGHTF. Fl. Scot. ii, 700. DE NOT. Syll. musc. Ital. 163.—Var. *β. humile* SWTZ. Adnot. bot. 141.—Var. γ. *minus* BR. SCH. Bry. Eur. iv, mon. 13. C. MUELL. Synops. i, 221. WILS. Bry. brit. 212. SCHPR. Coroll. 92.—Var. γ. *humile* SCHPR. Synops. 449, et 2 ed. 546.—Var. δ. *minus* RABENH. Deutsch. Krypt.-Fl. ii, P. III, 239. GIRGENS. Naturg. Moos. Livl., &c., 365.

Pol. yuccæfolium HOPP. in Sturm Deutsch. Fl. ii, 4 p.p.

* *Pol. cubicum* LINDB. in Not. ur Sällsk Fl. Fn. fenn. ix, 117.

HAB.—Wet heaths. Not uncommon. Oakmere. (*Wilson*) ! !

Regarded by Lindberg as a subspecies, and named *cubicum*, reaching he says a height of 1 foot, and corresponding to the **P. strictum* in its relation to the typical species.

Var. δ. **Fastigiatum** (*Lyle.*) *Wils.*

Stems taller, fastigiate-branched, densely tufted; leaves shorter, a little recurved at apex when dry, more deeply channelled, with higher lamellæ; capsule smaller, cubical.

SYN.—*Polytr. fastigiatum* LYLE MSS.

Pol. commune Var. γ *β. fastigiatum* WILS. Bry. brit. 212.

* *Pol. cubicum* Var. γ. *fastigiatum* LINDB. in Not. ur Sällsk. Fn. et Fl. fenn. förh. ix, 119.

HAB.—Dry moors in mountain districts.

Near Airth, Scotland (*T. Lyle* 1849) ! Cliviger moor, Keb Clough and Longfield moor (*Nowell* 1849) ! ! Winslade, Hants. (*Hill* 1861) ! Easterside, Yorks. (*Baker* 1855). Appleton, Lanc. (*Wilson*) !

This appears to be a form depending on arrest in the line of growth, and a corresponding state is met with in other species, as *P. juniperinum*, *urnigerum* and *piliferum*, sometimes each innovation bearing a capsule, so that we see ten or twelve on one root.

Few mosses offer better material than *P. commune*, for an examination of the various organs; thus the beautiful rosette-shaped male inflorescence is easily dissected, and the antheridia when fully perfected afford an abundant supply of active antherozoids, readily seen by a sufficient magnifying power, the paraphyses also both of the filiform and spathulate kind being well developed. The calyptra when stripped of its villose indumentum, will be seen to be small and cucullate, and in its early stage will show that this

elegant coat of long hairs is produced with great rapidity, and chiefly from the apex of the organ. The capsule shows small stomata in the cuticle above the hypophysis, and on section we observe the corrugated spore sac, suspended externally from the lining of the capsule and internally from the columella by numerous delicate cellular threads.

In addition to the description of the epiphragm already given, it may be mentioned that in *P. attenuatum*, *gracile* and *sexangulare*, there is also a thick intramarginal ring beneath.

TAB. V.

A. *Catharinea angustata.*

a. female plant (Doune, *McKinlay*). b. male plant (Hurst, *Mitten*).

B. *Catharinea undulata.*

a. typical form (Abbey wood, *Braithwaite*). β. var. *minor* (Ashton, *Hunt*).

C. *Catharinea crispa.*

a. female plant (New Jersey, *James*). b. male plant (Hebden bridge, *Hobkirk*). β. var. *densifolia* ♂ (Oakmere, *Wilson*).

D. *Oligotrichum incurvum.*

a. b. female and male plant (Ben Lawers, *Braithwaite*).

TAB. VI.

A. *Polytrichum subrotundum.*

a. b. female and male plant (Virginia water, *C. F. White*). β. var. *longisetum* (Ditto).

B. *Polytrichum aloides.*

a. b. female and male plant (Wimbledon, *Braithwaite*). β. var. *Dicksoni* (Strome ferry, *Hunt*).

C. *Polytrichum urnigerum.*

a. b. female and male plant (Bowdon, *Hunt*). β. var. *humile* (Aislaby, *Braithwaite*).

D. *Polytrichum alpinum.*

a. b. female and male plant (Ben Ledi, *Braithwaite*).

TAB. VII.

A. *Polytrichum sexangulare.*

a. b. female and male plant (Glen Callater, *Hunt*).

B. *Polytrichum gracile.*

a. b. female and male plant (Hale moss, *Wilson*).

C. *Polytrichum attenuatum.*

a. b. female and male plant (Rigg mill, Whitby, *Braithwaite*).

TAB. VIII.

A. *Polytrichum piliferum.*

a. b. female and male plant (Wimbledon, *Braithwaite*).

B. *Polytrichum juniperinum.*

a. b. female and male plant (Ulpha moss, *Barnes*).

C. *Polytrichum strictum.*

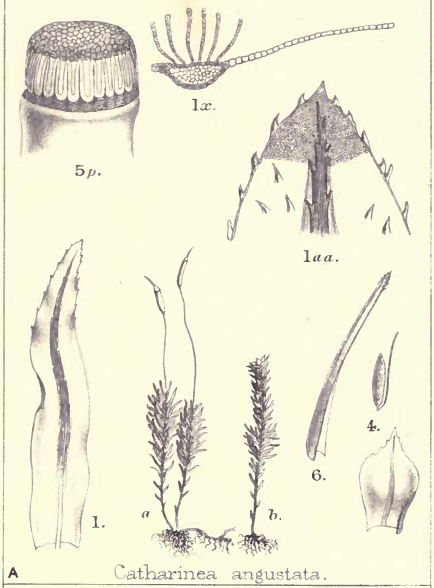
a. b. female and male plant (Glen Callater, *Hunt*).

TAB. IX.

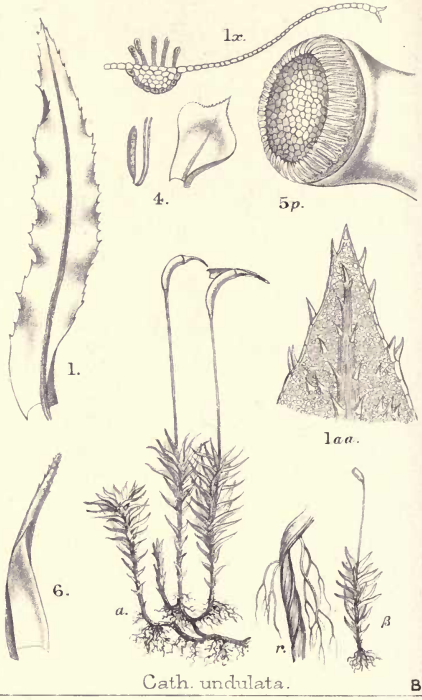
Polytrichum commune.

a. b. female and male plant (Goathland, *Braithwaite*). β. Var. *perigoniale.* γ. Var. *minus.* δ. Var. *fastigiatum.*

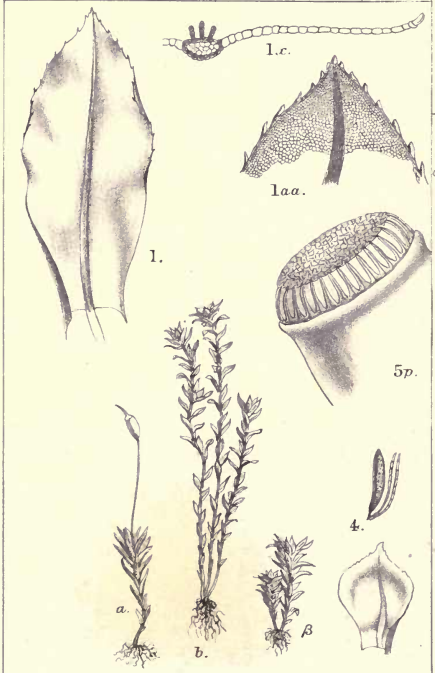
1. Leaf. mag. 1 x. Transv. section of leaf. 1 lx. Ditto of one of vertical lamellæ. 1 a. Apex of leaf. 1 aa. Areolation of same seen from the back. 1 am. Areolation of margin. 2. Perich. bract. 4. Bract, antheridium and paraphyses. 5. Capsule. 5 p. Mouth and peristome. 6. Calyptra. 7. Trans. sect. of columella. 8. ½ of Epiphragm, internal face. 9. Two teeth, internal face; crest removed from one. 10. Trans. sect. of stem. r. Root mag. v. Vaginula.



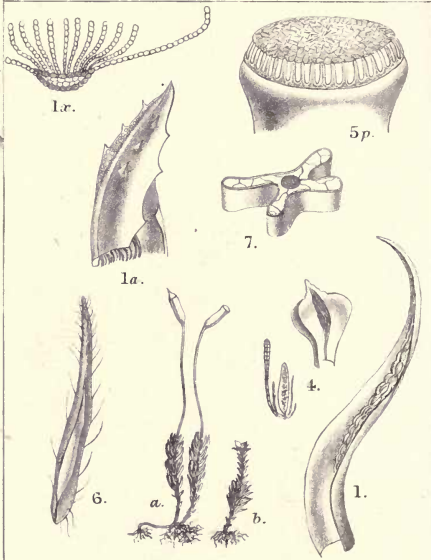
A Catharinea angustata.



Cath. undulata. B

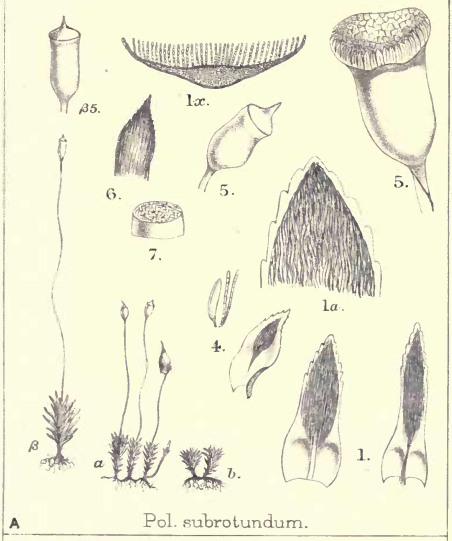


C Cath. crispa.

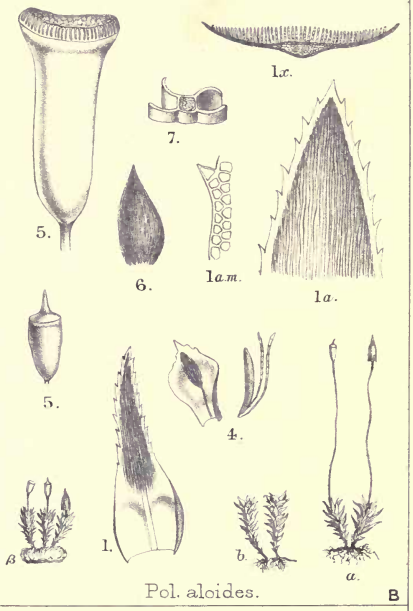


Oligotrichum incurvum. D

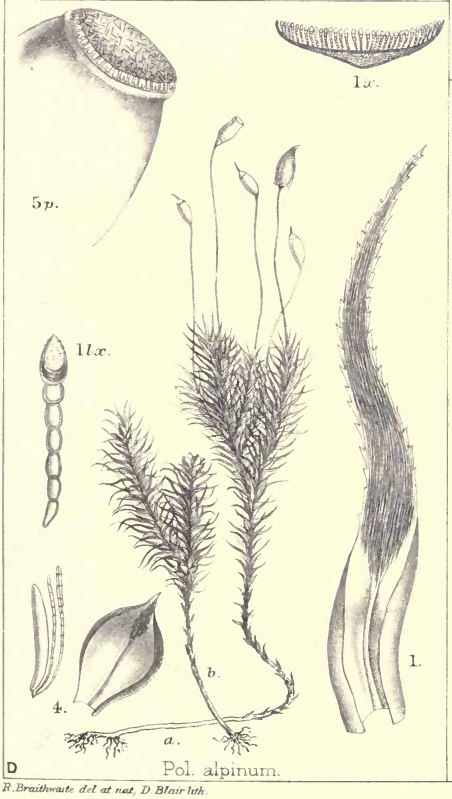
R. Braithwaite del. et nat. D. Blair lith. Mintern Bros. imp.



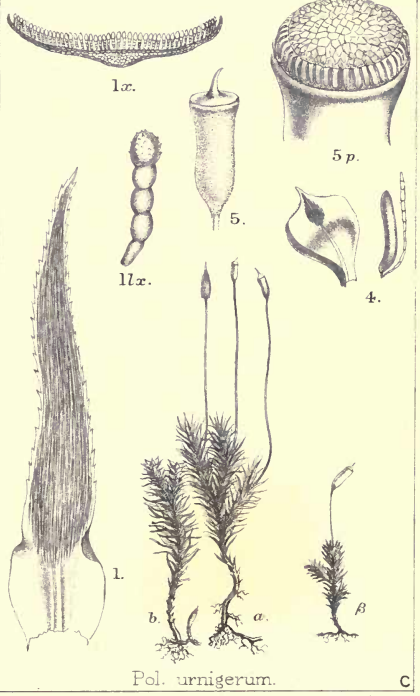
A Pol. subrotundum.



Pol. aloides. B

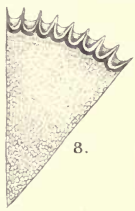


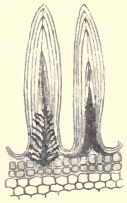
D Pol. alpinum.



Pol. urnigerum. C

R. Braithwaite del. at nat. D. Blair lith. Mintern Bros. imp.


8.

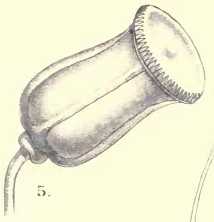

9.

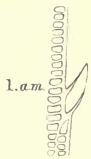

1. *x*.


1. *l.c.*


4.

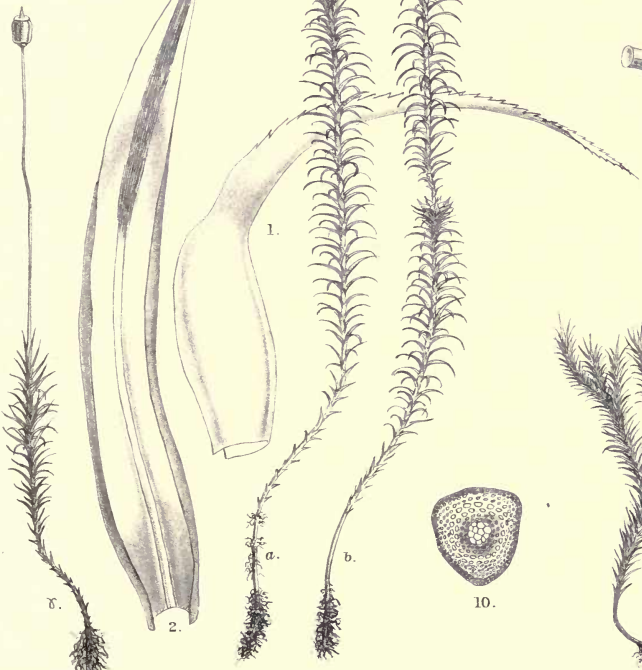

4.


5.


1. *a.m.*




β.


1.

γ.

2.

a.

b.

10.


δ.

Pol. commune.

R. Braithwaite del. ad. nat. D. Blair lith. *Mintern Bros. imp.*

FISSIDENTACEÆ.

APRIL 1ST, 1881.

FISSIDENS Hedw.

* *Acrocarpous.*

1. **F. exilis** *Hedw.*
2. — **pusillus** *Wils.*
3. — **incurvus** *Starke.*
4. — **viridulus** (*Swartz*) *Wahlenb.*
5. — **bryoides** (*L.*) *Hedw.*
6. — **Orrii** (*Lindb.*)
7. — **osmundoides** (*Swartz*) *Hedw.*
8. — **rufulus** *Br. Schimp.*
9. — **serrulatus** *Brid.*

** *Cladocarpous.*

10. — **decipiens** *De Not.*
11. — **taxifolius** (*L.*) *Hedw.*
12. — **adiantoides** (*L.*) *Hedw.*
13. — **polyphyllus** *Wils.*

Div. 2. ARTHRODONTEI.

Teeth of peristome transversely jointed, composed externally of two rows of coloured cells, with a divisural line between; sometimes wanting.

† GAMOPHYLLEÆ.

Leaves bifarious, inserted vertically, with a stipular appendage adnate to the nerve and part of upper lamina and sheathing the stem.

Fam. 5. FISSIDENTACEÆ.

Plants gregarious or densely cæspitose, very variable in size, simple or branched, complanate, frondiform, acrocarpous or cladocarpous. Leaves distichous, alternate, inserted vertically, each with a median nerve, united to which for a greater or less extent is a second series of small lobules or stipules, which with the upper half of the leaf base sheathe the stem in an equitant manner; cells parenchymatous, usually incrassate, often strongly papillose. Capsule and peristome dicranoid. Male infl. gemmiform, axillar, radical or terminal.

Besides the great genus *Fissidens*,—of which *Conomitrium* and *Octodiceras* are regarded as sections—the monotypic *Sorapilla* Spruce is the only other member, though Lindberg also adds to the family his genus *Mittenia* (=*Mniopsis* Mitt. non Dumort.) The species are distributed through all the tropical and temperate regions of the world, and inhabit wet banks and rocks, sometimes trunks of trees, and a few float in water.

FISSIDENS Hedwig.

Capsule on a terminal or lateral seta, symmetric or obliquely incurved, narrowed at base. Calyptra cucullate or mitriform. Peristome of 16 teeth, cleft half-way or more into two rough subulate legs; or sometimes truncate and irregular, geniculato—inflexed when dry. Leaves scalpelliform, the upper basal part conduplicate and amplexicaul.

This most natural and extensive genus was established by Hedwig in his Fund. Musc. P. II, p. 91 (1782), with the character "*Peristome simple, of* 16 *rather short inflexed teeth; male fl. gemmiform, in the axils of leaves*," and he refers to it as species, *Hyp. bryoides, taxifolium, adiantoides and sciuroides* L. figuring the last, presumably as the type. For this reason, and too rigidly we think, Lindberg retains *Fissidens* for *Leucodon*, and transfers all the rest to *Schistophyllum*. By this latter name we are at once reminded of the very anomalous structure of the leaves, and of the different theories which have been ad-

vanced to account for it. One of these was that the leaf to a certain extent was split vertically to embrace the stem; but this is not tenable, as each half of the split portion is of equal thickness to the rest of the leaf. Another view which has met with general acceptance is that the double portion alone is the true leaf (*lamina vera* C. MUELL.), and all the rest is an outgrowth from it, the portion behind the *lam. vera* being termed *lam. dorsalis*, and the two wings beyond these up to the apex constituting the *lam. apicalis*. However plausible this view may appear, it does not satisfy us, for there are species in which the duplicate part is nearly or altogether wanting, e.g. *F. dealbatus* from New Zealand. The most rational explanation seems to be this, that the additional lobule is of the nature of a stipule, arising on the opposite side of the stem, which has become adnate to the nerve by the whole lower margin, the upper margin being free and parallel to the corresponding margin of the leaf. Lindberg's names for the several parts are clear and simple, and are *vaginant laminæ* for the conduplicate portion, *superior lamina* for the continuation of this to the apex, and *inferior lamina* for the whole length of the part below the nerve.

The small species of the *incurvus* group present great variation in the position of the male infl., and I am satisfied that no reliable specific character can be founded on it; a point noticed by Lindberg to some extent confirms this, viz., that in some autoicous species, the male is connected with the base of the female by rhizomatous radicles which in course of time disappear, while the male continues to grow on as an independent plant, and the species thus becomes dioicous. This elegant genus numbers 320 species, and besides the British, five others are European.

CLAVIS TO THE SPECIES.

Fruit terminal.	
Leaves not bordered.	
Minute, autoicous, lid conic.	*exilis.*
Robust, dioicous, lid rostrate.	*osmundoides.*
Leaves bordered.	
Border narrow, thickened.	
Nerve reaching apex and then confluent with the border.	
♂ axillar, leaf with a short point.	*bryoides.*
♂ radical, leaf with a long acute point.	*Orrii.*
Nerve lost at apex.	
Small species; leaves acute.	
Dioicous, capsule inclined, leaves very narrow, acute.	*pusillus.*
Autoicous, capsule incurved, cernuous.	*incurvus.*
Autoicous, capsule equal or slightly asymmetric, erect, or inclined.	*viridulus.*
Robust species; leaves rather obtuse.	*rufulus.*
Border not thickened, of 4 rows of cells.	
Leaves eroso-serrate at apex.	*serrulatus.*
Fruit lateral.	
Autoicous.	
♂ radical, nerve excurrent.	*taxifolius.*
♂ axillar, nerve lost below apex.	*adiantoides.*
Dioicous.	
Leaves short, with a pale border, serrulate at apex.	*decipiens.*
Leaves very long, not bordered, nearly entire at apex.	*polyphyllus.*

1. FISSIDENS EXILIS *Hedw.*

Autoicous; very small; leaves 3—4 pairs, lanceolate-oblong, not bordered, serrulate at margin; capsule erect, elliptic, with a narrow annulus, lid conico-rostellate. (T. X, A.)

SYN.—*Hypnum minutum* L. MSS. in herb.

Bryum viridulum DICKS. Cr. fasc. I, 3, t. 1, f. 5 (1785).

Fissidens exilis HEDW. Sp. musc. 152, t. 38, f. 7—9, excl. syn. L. (1801). SCHULTZ Fl. Starg. 291 (1806). BRID. p.p. Sp. musc. ii, 163 (1812); Mant. 187 (1819); Bry. univ. ii, 638 (1827). SCHWAEGR. Suppl. I, P. II, 4 (1816) p.p. WILS. Bry. Brit, 302, t. 53 (1855). SCHIMP. Syn. musc. 103 (1860), et 2 ed. 111 (1876). BERK. Handb. Br. m. 160 (1863). HOBK. Syn. Br. m. 135 (1873). HUSN. Mouss. nord-ouest 61 (1873).

Dicranum viridulum SM. Eng. Bot. t. 1368 (non descr. nec Swartz).

Dicr. bryoides β. minus TURN. musc. hib. 53 (1804).

Hyp. trifoliatum DON MSS. in herb. Turn.

Fiss. bryoides var. exilis RÖHL. Deutsch. Fl. iii. 76 (1813).

Skitophyllum exile LA PYL. in DESV. Journ. Bot. 1813, 34, t. 38, f. 1.

Fiss. Bloxami WILS. in Lond. Journ. Bot. 1845, p. 195, t. 9. C. MUELL. Syn. musc. i, 66 (1849). BR. SCHIMP. Bry. Eur. i, Mon. Suppl. 1, n. 8 (1850). MILDE Bry. Siles. 80 (1869).

Autoicous; minute, deep green, closely gregarious. Stem 1 line long, inclined; leaves 3—4-jugous, lower minute, upper obliquely lanceolate-oblong, acute, nerved to apex, not bordered, the margin crenulate or serrulate, vag. lam. ½ length of leaf, inf. lam. linear-lanceolate, ending at middle of vag. lam., areolation rather lax. Capsule erect, on a red seta 2 lines long, elliptic, with a short neck, brown with a red mouth; calyptra conic, cucullate, lid red, long as capsule, conico-rostellate; annulus pale, of two rows of cells, not unrolling; peristome red, geniculate, spores olive-brown.

Male infl. very minute, gemmiform, radical, or attached to the root tomentum, bracts ovate, acute, antheridia very small, without paraphyses.

HAB.—Shady banks by ditches and in woods. Fr. 1—2.

Boxhill and Enfield Chase (*Dickson*). Burnside and near R. Sherbet, Forfar (*Don*, 1802)! Budd's Clough, Cheshire and Warrington (*Wilson*, 1834). Orton and Gopsal Woods, Twycross (*Bloxam*, 1844)!! Hurstpierpoint (*Mitten*, 1847)! Kirkham, Yorks. (*Spruce*). Near Keston Common, Kent (*Braithwaite*, 1865)!! Bowdon, Cotteral wood, Mottram and Ashley, Cheshire (*Hunt*)!! Todmorden (*Nowell*, 1863)!! Prestwich (*Hunt*, 1869)! Bagley wood, Oxford (*Boswell*, 1861)! Sellack, Hereford (*Rev. A. Ley*). Holwell, Dorset (*Rev. H. Wood*)!! Kelvedon Hall woods, Essex (*Varenne*, 1880)!! Luscombe wood, Teignmouth (*Miss Jelly*). Near Bearley and Knowle, Warwick (*Bagnall*)!! Levens, Westmoreland (*Barnes*)!

Readily known by its crenulate non-margined leaves, and probably more common than supposed, its small size and early appearance causing it to be overlooked. It was constantly confounded with *F. viridulus* by the older bryologists.

2. FISSIDENS PUSILLUS *Wils.*

Dioicous; very small; leaves 3—5 pairs, narrowly lanceolate, acuminate, entire with a very narrow border, nerved to apex; capsule oval-cylindric, erect or inclined, lid conic, obliquely rostellate. (T. X, B.)

SYN.—*Fissidens pusillus* Wils. MSS. MILDE Bry. Siles. 82 (1869). SCHIMP. Syn. 2 ed. 113 (1876). HOBK. Syn. Br. m. 136 (1873).

F. viridulus var. *β. pusillus* WILS. Bry. Brit. 303 (1855).

F. incurvus var. *pusillus* SCHIMP. Syn. 104 (1860). HUSN. Mouss. nord-ouest 62 (1873).

Heteroicous (dioicous and rarely autoicous); very small, simple or branched at base. Stem short, inclined; leaves pale green, 3—4-jugous, upper pair long, linear-ensiform, the rest shorter oblongo-lanceolate, the apex acuminate, margin quite entire, with a very narrow border vanishing below the apiculus, nerve lost at the point; vag. lam. not reaching middle of leaf, inf. lam. semi-lanceolate, rapidly narrowing at base and lost before reaching the stem; cells oval or rounded. Capsule on a pale seta, leptodermous, very small, erect or inclined, ovali-cylindric, strongly contracted below the mouth when dry; lid conic, somewhat obliquely rostellate; peristome deep red, arising below the orifice, teeth deeply cleft, the legs subulate, filiform, rough. Male plant minute, simple or with 1—2 branches, the bracts sheathing, with a short lamina; very rarely a male ramulus arises at base of fertile stem.

HAB.—Wet sandstone rocks. Fr. 8—11.

Hill cliff dingle and Winwick stone delph, Warrington (*Wilson* 1844)!! Todmorden (*Nowell* 1852). Mowthorpe dale and about Castle Howard (*Spruce*)!! Pope's walk, Bath (*Mrs. Hopkins*). Albourne (*Mitten*). Near Heptonstall and Pontefract (*Dr. Wood*)! Ashley Mill, Bowdon and Clitheroe (*Hunt*)!! Gordale, Malham (*Hunt* 1867)! Lover's Leap, Buxton (*Hunt* 1860)!! Dailly (*Hunt* 1865). Seckley (*Dr. Frazer* 1868)! Levens Park (*Barnes* 1871)! Trungle moor, Penzance (*Curnow* 1860). Ecclesbourne (*Holmes* 1876)!!

Next to *F. exilis* the smallest of our species, and forming delicate green patches on the surface of the sandstone, to which it clings closely by the radicular tomentum. For some excellent remarks on this species see Dr. Spruce's paper in Journ. Bot. 1880, p. 360.

Var. *β.* **Lylei** *Wils.*

Leaves broader, without any border.

SYN.—*Fiss. Lylei* WILS. MSS. *F. viridulus* var. *ζ. Lylei* WILS. Bry. Brit. 304.

HAB.—Dam head at Airth (*Lyle* 1849)! Ashley Mills and Marple, Cheshire (*Hunt* 1868)!! Allesley, Warwick (*Bagnall*)!! Gilbrook (*Marratt*). King's Caple, Hereford (Rev. A. Ley).

Var. *γ.* **madidus** *Spruce.*

Leaves 5-jugous, longer and narrower. Capsule subcylindric, the lid obliquely rostrate, sometimes as long as capsule. Infloresc. most frequently autoicous, the male on a basal branch; sometimes dioicous. (SPRUCE in Journ. Bot. 1880, p. 361).

HAB.—On dripping stones near the Obelisk bridge in Castle-Howard Park (*Spruce* 1844) ! !

Dr. Spruce having kindly favoured me with specimens of this plant, I can only confirm the accuracy of his description both of the type and variety; like him I have also failed in finding any plants with the male infl. situated as described by Schimper.

3. FISSIDENS INCURVUS *Starke.*

Autoicous; leaves oblongo-lanceolate, narrowly bordered, apiculate; capsule cernuous, irregular, incurved, lid conico-rostellate. (T. X, C.)

SYN.—*Fissidens incurvus* STARKE MSS. RÖHL. Deutsch. Fl. iii, 76 (1813). SCHWAEGR. Suppl. I, P. II, p. 5, t. 49 (1816). FUNCK Moostasch. 32, t. 22, n. 2 (1821). Br. SCHIMP. Br. Eur. i, Mon. 6, t. 1, p.p. (1843); Syn. musc. 104 (1860); et 2 ed. 112 (1876). RABENH. Deutsch. Kr. Fl. ii, P. III, 304 (1848). BERK. Handb. Br. m. 160 (1863). MILDE Bry. Siles. 81 (1869). DE NOT. Epil. Briol. Ital. 485 (1869). HUSN. Mouss. nord-ouest 61 (1873). HOBK. Syn. Br. m. 136 (1873).

Dicranum incurvum WEB. MOHR Bot. Tasch. 162 and 465 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 82, t. 37 (1810).

Dicr. viridulum SM. Fl. Brit. iii, 1230 (1804), Eng. Bot. t 1368, quoad descr.

Dicr. bryoides var. β. HOOK. TAY. Musc. Br. 49 (1818).

Fiss. bryoides var. γ. HUEB. Musc. germ. 219 (1833).

Fiss. tamarindifolius BRID Bry. un. 684, p.p. (1827).

Fiss. viridulus var. ε. *incurvus* WILS. Bry. Brit. 303, t. 53 ε. (1855).

Fiss. sardous DE NOT. Epil. Briol. Ital. 486 (1869).

Autoicous; gregarious or somewhat cæspitose; stem very short, slender, ascending. Leaves 4—6-jugous, firm, flat or decurved, oval-oblong and lineal-lanceolate, apiculate, nerved to apex, with a very narrow border becoming wider toward base; vag. lam. lanceolate, half length of leaf, infer. lam. lanceolate, very narrow at base; cells small, rounded. Seta long, red, capsule pachydermous, cernuous or horizontal, pale brown, arcuato-incurved, with a distinct neck, oval or subcylindric; lid conic, rostellate, red; calyptra pale, rostrate; peristome not inserted below the mouth. Male at the base of female, gemmiform, on a very short branch; bracts broadly obovate with a small vertical lamina.

HAB.—Clay banks and pastures. Fr. 2—4.

Near York (*Spruce*) ! Orford Park, Warrington (*Wilson*). Hurstpierpoint (*Mitten*). Hareley wood, Todmorden (*Nowell* 1853) ! ! Castle mills, Ashley mill and Butt's Clough (*Hunt*) ! ! Buckland, Faringdon (*Mrs. Milne*) ! ! Iffley and Watereaton, Oxon (Boswell 1861) ! Marple (*Scholefield* 1868) ! Durdham Downs (*Miss Atwood* 1854) ! Merton Heath, Dorset (*Rev. H. Wood*). Solihull (*Bagnall*). Truro (*Curnow*).

In the typical form figured this species appears to be distinct enough, but other states are met with in which the capsule is but slightly curved, and thus differing but little from that of the next species, while the leaves of both are nearly alike. After the fall of the lid, the capsule loses much of its curvature and becomes horizontal.

Var. β. **tamarindifolius** *Don.*

Stems taller, fasciculate from the base; leaves multijugous, more distant, shorter, broader, crisped when dry. Fertile branch springing

from the lower part of a barren shoot, capsule shorter, reddish-brown, peristome paler. Male infl. gemmiform, near the base of stem.

SYN.—*Hypnum tamarindif.* DON. in lit. sec. Smith.

Dicranum tamarindif. SM. Fl. Brit. 1231. TURN. musc. Hib. 55.

Skitophyllum tamarindif. LA PYL. in DESV. Journ. Bot. 1813, t. 37.

Fissidens tamarindif. BRID. Sp. musc. I, 165; Mant. 187, et Bry. un. 684, p.p. WILS. Bry. Brit. 308, t. 53. BERK. Handb. Br. m. 157. HOBK. Syn. Br. m. 138.

Fiss. trichomanoides WILS. MSS.

HAB.—On clay soil, banks and fallow fields. Fr. 2—3.

Near Forfar (*Don*). Near Over, Cheshire, and Warrington (*Wilson*)! Stansfield, Todmorden and Heptonstall (*Nowell* 1850)!! Hurstpierpoint (*Mitten*). Oakmere, Ashley and Clifton Junction (*Hunt* 1863)! Roskelly Cliff, Penzance (*Curnow* 1865)!!

This variety is distinguished by the great abundance of sterile surculi, but otherwise it presents no structural differences to separate it from *F. incurvus*.

4. FISSIDENS VIRIDULUS (*Swartz*) *Wahlenb.*

Autoicous; very small, simple; leaves lanceolate, bordered, entire, acute, nerved to apex; capsule erect or a little inclined, symmetric, oval-oblong, lid conic, acuminate. (T. X, D.)

SYN.—*Bryum viridulum* L. in Herb. p.p.

Dicranum viridulum SWARTZ Musc. Suec. 84, t. 2, f. 3 (1799). WEB. MOHR Bot. Tasch. 161 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 81, t. 36 (1810). VOIT Musc. Herbip. 37 (1812).

Fissidens virid. WAHLENB. Fl. lapp. 334 (1812), Fl. carp. 342 (1814). WILS. Bry. Brit. 303, t. 53 (1855). BERK. Handb. Br. m. 159 (1863). HOBK. Syn. Br. m. 136 (1873).

Fiss. exilis FUNCK Moostasch. t. 22, n. 1 (1821), non HEDW.

Fiss. incurvus p.p. BR. SCHIMP. Bry. Eur. i, Mon. 6, t. 1 (1843), Syn. musc. 104 (1860) et 2 ed. 112 (1876).

Fiss. bryoides p.p. BRIDEL et pl. auct.

Autoicous; stems short, slender, inclined. Leaves 5—8-jugous, pale green, crisped when dry, lanceolate, acute, nerved to apex, border vanishing usually at point, vag. lam. about half length of leaf, inf. lam. ceasing before reaching base. Capsule leptodermous, symmetric, erect or inclined, sometimes more or less oblique, oval, olivaceous-brown, seta pale; lid conico-rostellate, red; peristome arising below mouth of capsule. Male infl. terminal on a branch at base of fertile stem, sometimes becoming dioicous.

HAB.—On clay banks, sandstone rocks and stones; not uncommon. Fr. 11—2.

St. Vincent's rocks (*Wilson* 1860). Clitheroe and Pontefract (*Dr. Wood*)! Plymouth (*Holmes*)!! Knowle (*Bagnall*). Melrose (*Jordan*). Howth (*Orr*). Ecclesbourne (*Holmes*)!! Barmouth (*Rogers*)!! Beckhole, Whitby (*Braithwaite* 1858)!!

Swartz's specimens in Smith's herb. have the capsule perfectly symmetric and erect. By all continental Botanists of our own time this is united to

F. incurvus, and yet there is a great apparent difference in the capsules which is our chief reason for keeping them separate. Lindberg regards it as a subspecies of *F. incurvus*.

Var. *β.* **fontanus** (*Schimp.*)

Taller and more robust; stem ½—2 in. long, flexuose, ascending or submersed, simple or dichotomous; leaves multijugous, rather distant, deep green, large and succulent, nerve vanishing below apex as also does the border, which is thicker and obsoletely denticulate toward point. Seta stout, reddish yellow, capsule erect or suboblique, obovate, pale brown, lid conico-rostellate.

SYN.—*Fiss. incurvus var. β. fontanus* BR. SCHIMP. Br. Eur. i, Mon. 7, t. 1 *β.* et var. *crassipes* SCHIMP. Synops. 104. HUSN. Mouss. nord-ouest 62.

Fiss. fontanus SCHIMP MSS.

Fiss. crassipes WILS. MSS. BR. SCHIMP. Br. Eur. Mon. Suppl. 1, n. 9. MILDE Bry. Siles. 82. DE NOT. Epil. Briol. Ital. 484. HOBK. Syn. Br. m. 136. SCHIMP. Synops. 2 ed. 113.

Fiss. viridulus var. *γ. major* WILS. Bry. Brit. 303, t. 53, *γ.*

HAB.—Attached to woodwork and stones in sluices. Fr. 9—10.

Ireland (*Turner* 1809). Hulme (*Wilson* 1844) ! ! York and Castle Howard (*Spruce*) ! Ashley sluice, Bowden (*Hunt* 1863) ! ! Sandford Lasher, Oxford (*Boswell* 1864) ! ! Bath (*Mrs. Hopkins* 1861) ! Wrexham (*Wilson* 1863) ! ! Croft, Thirsk, and Topcliffe (*Baker*). Eaton Bishop, Hereford (*Rev. A. Ley*). Tothill (*Holmes*).

Like all aquatic mosses the leaves are of thicker substance, and dark green colour. The male inflorescence appears to be very scarce.

5. FISSIDENS BRYOIDES (*L.*) *Hedw.*

Autoicous, with the male infl. axillary; leaves oblongo-ligulate, acute, with a thickish hyaline border, nerve reaching point or excurrent, capsule ovate, erect or inclined, lid conico-rostellate. (T. X, E.)

SYN.—*Muscus polytrichoides exiguus, capitulis in extremis cauliculis seu foliis, subrotundis erectis* RAY Syn. St. Brit. 2 ed. 35, n. 4 (1696).

Hypnum repens filicifolium, non ramosum, pediculis brevioribus versus foliorum summit. egredientibus DILL. in RAY Syn. 3 ed. 88, n. 42 (1724).

Hypnum taxiforme exiguum versus summitatem capsuliferum DILL. Hist. musc. 262, t. 34, f. 1 (1741); et Herb.

Hyp. bryoides L. Sp. pl. ii, 1123 (1753); Fl. suec. 1012; Syst. Veg. 950. HUDS. Fl. angl. 418 (1762). WEISS Cr. Gott. 217 (1770); Fl. Dan. t. 473. NECK. meth. musc. 152 (1771). WITH. Bot. arr. Br. veg. 680 (1776). LIGHTF. Fl. Scot. ii, 739 (1777). RELH. Fl. cant. 408 (1785). WEB. Spic. Fl. Gott. 46 (1778). VILL. Pl. Dauph. iii, 894 (1786). HOFFM. Deutsch. Fl. ii, 55 (1796). ABBOT Fl. bedf. 244 (1798). HULL Br. Fl. P. 2, 267 (1799). Eng. Bot. t. 625 (1799), p.p.

Fiss. bryoides HEDW. Fund. musc. P. 2, 91 (1782); Musc. fr. iii, 67, t. 29 (1792); Sp. musc. 135 (1801). ROTH Fl. germ. i, 459 (1788). BRID. musc. rec. ii, P. 2, 139 (1801); Sp. musc. I, 164 (1806); Mant. 188 (1819); Bry. univ. ii, 686 (1827). RÖHL. Moosg. Deutsch. 288 (1800). P. BEAUV. Prodr. 57 (1805). SCHULTZ Fl. Starg. 297 (1806). SCHWAEGR. Suppl. i, P. II, 7 (1816). FUNCK moostasch. 33, t. 22, f. 3 (1821). HARTM. Skand. Fl. HUEBEN. musc. germ. 219 (1833). BR. SCHIMP. Bry. Eur. i, Mon. 8, t. 2 (1843); Syn. musc. 103 (1860), et 2 ed. 111 (1876). RABENH. Deutsch. Kr. Fl. ii, P. 3, 305 (1848). C. MUELL. Syn. musc. i, 58 (1849). WILS. Bry. Brit. 304, t. 16 (1855). BERK. Handb. Br. m. 159 (1863). MILDE Bry. siles. 81 (1869). DE NOT. Epil. Bri. ital. 483 (1869). HOBK. Syn. Br. m. 136 (1873). HUSN. Mouss. nord-ouest 61 (1873).

Fuscina bryoides SCHRANK Baiers. Fl. ii, 451 (1789); Prim. Fl. Salisb. n. 826 (1792).

Dicranum bryoides SIBTH. Fl. oxon. 179 (1794). ROTH Fl. germ. iii, 181 (1795). SMITH Fl. Brit. iii, 1232 (1804). TURN. Musc. hib. 56 (1804). SCHKUHR Deutsch. Kr. Gew. P. II, 82, t. 37 (1810). HOOK. TAYL. Musc. Brit. 51, t. 16, p.p. (1818). GRAY Nat. arr.. Br. pl. i, 733 (1821). MACK. Fl. Hib. P. 2, 21 (1836).

Skitophyllum bryoides LA PYL. in DESV. Journ. Bot. 1813, 40, t. 35, f. 4.

Schistophyllum bry. BRID. MSS. LINDBERG.

Fiss. inconstans SCHIMP. Syn. musc. 2 ed. 114 (1876).

Autoicous; deep green, densely gregarious or somewhat cæspitose. Stems ½—1 in. ascending from a declinate base; leaves 3-plurijugous, patulous, oblongo-ligulate, mucronulate, with a thickish hyaline border, confluent at apex with the excurrent nerve, or ending below a very minutely serrate apiculus; vag. lam. about half length of leaf, inf. lam. narrowed downward to the base and decurrent; areolation angular-rotundate. Capsule on a purple seta, erect or slightly inclined, ovate or oblong, small, brown; calyptra cucullate, lid conic-attenuate, short red; teeth of peristome deep red, cleft half way, the legs subulate, very scabrous; spores smooth. Male infl. axillar, numerous, bracts 4—5, vertical lamina minute, pointed, antheridia few, very small; sometimes also it is on a radical surculus.

HAB.—Damp shady banks in woods and edges of streams, common. Fr. 10—1.

Few persons have seen this little moss without admiring it, and occasionally it is found in shady crevices where spray falls, tinged with a steel blue gloss which renders it still more beautiful. It is usually credited with being the plant which attracted Mungo Park's attention when in great distress during his African wanderings, but unfortunately this is not correct, the species he brought back is a smaller plant with a short seta, and non-margined leaves which Mr. Mitten has named *Fiss. Parkii.*

I regard *F. inconstans Schimp.* (Sunningwell, Oxford, *Boswell* 1861) as rather of the nature of a sport than a permanent variety, as in structure it agrees in every respect with *F. bryoides.* The fruit is both terminal and from the middle on the same stem, and others have it radical like *F. taxifolius,* while the male infl. is axillar like the type, radical as in *F. incurvus,* and sometimes terminal on a separate plant; the same form has been found by Mr. Bagnall at Binton Bridges, Warwick, and it is very probable that *F. gymnandrus* BUSE forms another link in the chain. *F. rivularis* SPRUCE is quite distinct, having smaller areolation and a very thick border.

Var. *β.* **cæspitans** *Schimp.*

Plants 1—1½ in. high, sparingly branched by innovation, soft, bright green, in wide crowded patches interwoven with rufous purple radicles. Border of leaves narrow, vanishing below the very minutely serrate apiculus. Capsules pale, thin, ovato-rotundate, inclined.

SYN.—SCHIMP. Syn. musc. 2 ed. 111.

HAB.—Wet rocks under spray of a waterfall, Newlyn cliff, Penzance (*Curnow* 1868)!! In a stream at Kymal bridge, St. Creed (*Ralfs* 1879)!!

6. FISSIDENS ORRII *(Lindb.)*

Autoicous; very small. Leaves narrow, linear, very acute, with a thickened border and excurrent nerve. Capsule minute, obovate, cernuous, lid conico-rostrate. (T. X, F.)

SYN.—*Schistophyllum Orrii* LINDB. in Revue bryolog 1880, p. 97.

Autoicous (rhizautoicous); very small, pale or yellowish, cæspitose, innovating from brown rhizomatous tomentum. Leaves of sterile plant multijugous, rigid, straight, patent, linear-lanceolate, very acute, with a thickened yellow border confluent in the apex with the excurrent nerve; vag. lam. $\frac{2}{3}$—$\frac{3}{4}$ length of leaf, infer. lam. gradually narrowed to base and slightly decurrent; cells incrassate, oval and angular, smooth, pellucid. Leaves of fertile plant about 8-jugous, smaller. Seta slender, straight, yellow; capsule minute, pale, pachydermous, obovate, inclined; peristome brown-purple, legs of teeth very slender; lid large, pale, conico-rostrate, calyptra small, conical. Male infl. very minute, gemmiform, cohering to base of female stem, bracts sheathing, emarginate at apex, with a thick excurrent nerve, antheridia 3—6, without paraphyses.

HAB.—On stones in the Tolka river and at an old quarry on its north bank near Finglas bridge, Glasnevin Botanic Garden, Dublin (*D. Orr* 1854).

The close vicinity of a Botanic garden naturally casts some shade of doubt on the claims of this pretty little moss to be considered indigenous, as spores may have been introduced with the soil attached to foreign plants. Mr. Orr gathered and distributed it as *F. viridulus*, and the drawing is made from the original plant kindly lent by Prof. Lindberg.

7. FISSIDENS OSMUNDOIDES *(Swartz) Hedw.*

Dioicous; stems dichotomous, leaves crowded, scalpelliform, apiculate, margin minutely crenulate, not bordered, nerve vanishing; capsule erect, oval, calyptra mitriform, lid rostrate. (T. XI, A.)

SYN.—*Dicranum osmundoides* SWARTZ in Act. Holm. 1795, p. 240. TURN. Musc. Hib. 55 (1804). SMITH Fl. Brit. iii, 1233 (1804); Eng. Bot. t. 1662.

Dicr. bryoides SWARTZ Musc. Suec. 86, t. 2, f. 4 (1799). WEB. MOHR Bot. Tasch. 163 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 82, t. 37 (1810). Var *β. elongatum* HOOK. TAYL. Musc. Brit.

Hypnum asplenioides DICKS. Cr. fasc. 2, p. 10, t. 5, f. 5 (1790), excl. Syn. Swärtzii. WITH. Bot. arr. Br. Veg. 3 ed. 843 (1796). HULL Br. Fl. P. 2, 268 (1799).

Fiss. osmundoides HEDW. Sp. musc. 153, t. 40, f. 7—11 (1801). P. BEAUV. Prodr. 57 (1805). SCHULTZ Fl. starg. 292 (1806). BRID. Sp. musc. i, 168 (1806); Mant. musc. 188 (1819); Bry. univ. ii, 689 (1827). SCHWAEGR. suppl. I, P. II, 7 (1816). MART. Fl. cr. Erl. 109 (1817). FUNCK Moost. 33, t. 22, n. 4 (1821). HUEBEN. Musc. germ. 221 (1833). HARTM. Skand. Fl. BR. SCHIMP. Br. eur. i, Mon. 8, t. 3 (1843); Syn. musc. 106 (1860); 2 ed. 116 (1876). FIEDL. Syn. Laubm. Meckl. 130 (1844). RABENH. Deutsch. Kr. Fl. ii, P. 3, 305 (1848). C. MUELL. Syn. musc. i, 60 (1849). WILS. Bry. Brit. 305, t. 16 (1855). BERK. Handb. Br. m. 158 (1863). MILDE Bry. Siles. 82 (1869). DE NOT. Epil. Bri. Ital. 481 (1869). HOBK. Syn. Br. m. 137 (1873).

Skitophyllum osmundoides LA PYL. in Desv. Journ. Bot. 1813, p. 38, t. 25, f. 5.
Fiss. bryoides RÖHL. Deutsch. Fl. iii, 77 (1813). WAHLEN. Fl. Carp. 333 (1814).
Fiss. dicarpos BRID. Mant. 190; Bry. univ. ii, 698.
Conomitrium osmundoides C. MUELL. Syn. ii, 526 (1851).

Dioicous; in rather dense deep green or yellowish tufts, interwoven with rufous tomentum. Stem slender, erect, 1—6 in. high, repeatedly dichotomous; leaves multijugous, crowded, increasing in size upward, broadly lingulate or scalpelliform, with a short apiculus, margin minutely crenulate, not bordered; nerve vanishing below apex, vag. lam. ovato-lanceolate, about half length of leaf, inf. lam. linear-lanceolate, reaching base, but not decurrent; cells rather lax, rounded or oblong. Seta terminal, erect, purple; capsule erect or inclined, rather small, brown, pachydermous, oval or oval-oblong; lid long as capsule, conoid, rostrate, straight; teeth cleft to middle, the legs unequal, subulate, nodulose; calyptra submitriform, lobed at base. Male plant more slender, infl. terminal, inner bracts sheathing, with a narrow sword-shape lamina.

HAB.—In wet grassy places on heaths. Fr. 7.

Pentland hills (*Maughan* 1807). Aber (*Wilson* 1838)!! Longfield moor, Todmorden (*Nowell* 1855)!! Trossachs (*Shaw* 1861). Langbrigg Fell, Rydal (*Wood* 1864)! Tarbet, Cantire (*Hunt* 1866)!! Dunoon (*Stirton* 1866)! Woodside moor, Levens (*Stabler* 1868)! Lydford and Exwick, Devon (*Holmes*)!! Teesdale and Swaledale, Yorks. (*Baker*). Aultnaharra, Ross (*Howse* 1871)! Cromagloun and Ben Bulben (*Moore*). Glengariff (*Hunt*)! Llanberis (*Holmes*)!!

Distinguishable at once by its non-bordered leaves with large cells. The var. *microcarpus* SCHIMP. appears to be only a dense form with ill-developed fruit, to which Wilson's specimens from Aber closely approximate.

8. FISSIDENS RUFULUS *Br. Sch.*

Dioicous; leaves crowded, erecto-patent, cultriform, rather obtuse, entire, with a thick reddish border; capsule small, oval, erect; lid conical, obtuse. (T. XI, B.)

SYN.—*Fissidens rufulus* SCHIMP. Br. Eur. Mon. Suppl. T. II. (1851); Syn. musc. 106 (1860); et 2 ed. 120 (1876). MILDE Bry. siles. 84 (1869).
Fiss. ventricosus LESQ. in Mem. Calif. Acad. i, 7 (1868). SULLIV. Icon. Musc. Suppl. p. 45, t. 30 (1874).

Dioicous; densely cæspitose, blackish-green. Stems erect ½—1½ in. high, dichotomous, fastigiate-branched, with brown radicles among the leaves. Leaves crowded, erecto-patent, multijugous, nearly equal, cultriform, rather obtuse, with a thickened reddish border vanishing just below the minutely eroso-denticulate apex; nerve stout, reddish, ending with the border at apex; vag. lam. ½—⅔ length of leaf, somewhat inflated, acute at apex, where the margin is usually flexuose, inferior lam. lanceolate, narrowed gradually downward, and vanishing at the stem; cells incrassate, rounded-hexagonal, sparingly chlorophyllose.

Seta very short, terminal; perich. bracts resembling the leaves, but longer; capsule small, erect, pachydermous, narrowly oval, olivaceous; lid conical, obtuse; teeth of peristome erect, coarsely articulated, toward apex formed of spiral fibrils. Male plant shorter with terminal inflorescence, bracts obovate, dilated, with a short sword-shaped lamina.

HAB.—In streams, attached to rocks and stones. River Lune in Rigmaden Park, Westmoreland (*P. Dreesen*).

This interesting addition to our Flora has been found at the Rhine Falls, and at Salzburg, and we have no doubt it is also the same as the Californian *F. ventricosus* of Lesquereux. The capsules on our specimens are old and without operculum, and we have completed the drawings of these parts from Sullivant's figures. Our plants grow associated with *Cinclidotus*, those in the Rhine with *Fiss. grandifrons*, and the older leaves are generally worn and abraded by the current.

9. FISSIDENS SERRULATUS *Brid.*

Dioicous; stem tall, simple; leaves about 20-jugous, straight, lingulate, the margins serrulate with prominent cells, apex acute serrate. Capsule terminal inclined, oval-oblong, subventricose; lid conic, long-beaked. (T. XI, C.)

SYN.—*Fissidens serrulatus* BRID. Sp. musc. i, 170 (1806); Mant. musc. 190 (1819), et Bry. univ. ii, 704 (1827). MONT. in Ann. Sc. nat. et in Hist. nat. des Isles Can. par Webb & Berth. iii, 22, t. 2, f. 1 (1840). C. MUELL. Syn. musc. i, 69 (1849). SCHIMP. Bry. Eur. vi, Suppl. T. 3 (1851); Syn. 107 (1860) et 2 ed. 117 (1876).

Schistophyllum serratum BRID. MSS.

Fiss. divisus KUNTH.

Fiss. asplenioides var. *serrulatus* WILS. Bry. brit. 306.

Fiss. Langei DE NOT. Epil. briol. ital. 479 (1869).

Dioicous; laxly cæspitose, tall, simple or with many stems from base; stem simple or sparingly branched 1—3 in. high. Leaves crowded, multijugous, increasing in size upward, flat, glossy, pale green, coriaceo-membranous, lingulate, shortly acuminate at apex, which is often irregular and bent to one side; nerve thick, subflexuose, yellowish, vanishing in the eroso-serrate acute apex; vag. lam. about half length of leaf, inf. lam. linear, abruptly and narrowly decurrent at base; all margin with a border of four rows of rather larger yellowish cells, more distinct in the older leaves, without chlorophyl, minutely crenulate; rest of the areolation small rounded and angular. Fruit terminal on the stem or on a lateral innovation, rooting at the perichætium, and finally deciduous and forming a distinct plant; capsule on a short stout yellow flexuose pedicel, cernuous, oval, fulvous brown, pachydermous, contracted below the mouth when dry; lid large, conic with a longish straight beak; teeth large, deep purple, cleft into two longly subulate

nodulose legs. Male plants in separate tufts; infl. gemmaceous, axillar and terminal, bracts broadly truncate oval, with a narrow vertical lamina, serrate at apex, antheridia numerous, oblongo-cylindraceous, with very few paraphyses.

HAB.—Wet rocks and moist shaded soil. River side at Castle Hornoch, near Penzance, ♂ (Curnow, Nov. 1868)!! Mousehole cave, Penzance (Curnow, Dec. 1869)!!

This beautiful moss closely resembles *F. polyphyllus*, but may be readily distinguished by the apex of the leaf, which is acute with the margin sharply serrate. We have only the male and barren plants, and it truly belongs to the Canarian Flora, the fruiting plant having been brought from Teneriffe by Bory de St. Vincent. The species is also met with in Portugal, Tuscany, and at Monte Pisano, near Genoa, and at the latter station a few capsules have recently been found by Mr. Fitzgerald.

10. FISSIDENS DECIPIENS *De Not.*

Dioicous; fasciculate at base; leaves lineal-lanceolate, nerved to apex, with a pale border of rounded cells, margin crenulate, serrate toward apex; capsule suberect, ovate, lid rostrate. (T. XI, D.)

SYN.—*Fissidens decipiens* DE NOT. in PICCONE Elenc. musch. ligur. n. 181, et Cronac. briol. ital. in Comm. critt. ii, 98 (1866); Epil. Briol. ital. 479 (1869). MILDE Bryol. siles. 84 (1869). HOBK. Syn. Br. m. 138 (1873). SCHIMP. Synops. 2 ed. 118 (1876). SULLIV. Icon. musc. Suppl. p. 46, t. 31 (1874).

Fiss. adiantoides et *F. taxifolius* p.p. plur. auct.

Fiss. adiantoides β. *marginatus* (LA PYL.) BRID. Bry. univ. ii, 704 (1827).

Fiss. rupestris WILS. MSS.

Dioicous; in erect rather dense lurid-green tufts, intermediate between *F. taxifolius* and *adiantoides*. Stems sparingly branched, fasciculate at base, rigid. Leaves densely crowded, firm, lineal lanceolate, parabolically acute, the nerve reaching apex or vanishing below it; vag. lam. reaching half length of leaf, inferior lam. lanceolate, narrowed and slightly decurrent at base; margins very minutely serrulate, in upper part crenato-serrate, all with a pale border of four rows of incrassate rounded cells, the other cells obscure and smaller than those of *F. adiantoides*. Setæ from middle and lower part of stem, short, pale red, the perichætial bracts ovate concave, extended into a narrow lamina; capsule rather small, ovate suberect or inclined, brown, lid rostrate, nearly equal to capsule, peristome deep red, the teeth strong, cleft to middle into two nearly equal rough legs; spores small. Male plants in distinct tufts, the infl. axillar, bracts short, broadly ovate, apiculate.

HAB.—Wet rocks near the sea and on the ground in hilly places. Fr. 12—3.

Gale green (*Wilson* 1837). Stokenchurch woods, Oxon (*Dr. Ayres* 1841)! Beddgelert, Dennant and Conway (*Wilson* 1861)!! Croesor and Rhaglans (*Wilson* 1863)! High rocks, Tunbridge wells (*Mitten*). Treveylor valley, Penzance (*Curnow* 1868)!! Levens and Rayrigg, near Bowness, Westmoreland ♂, ♀ (*Barnes* 1869)!! Beeston Castle hill (*Wilson* 1836). Fin Glen, Campsie, and Tarbet, Cantire (*Hunt* 1864)! Llanberis (*Col. Palgrave* 1865). Ben Voirlich (*Shaw* 1862). Glengariff and Kenmare road (*Hunt* 1864)! Muckross (*Wilson* 1866).

In general aspect this moss comes nearest to *F. taxifolius* and in structure to *F. adiantoides*, but the leaf cells are decidedly smaller than in the latter species, and the pale border more marked.

11. FISSIDENS TAXIFOLIUS (*L.*) *Hedw.*

Autoicous; fasciculate at base; leaves oblongo-ligulate, nerve excurrent, margin minutely serrate; capsule from base of stem, oblong, cernuous, lid rostrate. (T. XI, D.)

SYN.—*Muscus filicifolius seu pennatus minor, pinnulis plurimis ad mediam costam annexis latiusculis crebris* RAY Syn. st. Brit. 2 ed. 35 (1696).

Hypnum repens filicifolium non ramosum, pediculis brevioribus ad radicem egredientibus DILL. in RAY Syn. 3 ed. 88 (1724).

Hyp. taxiforme minus basi capsuliferum DILL. Hist. musc. 263, t. 34, f. 2 (1741); et Herb.

Hyp. taxifolium L. Sp. pl. ii, 1122 (1753); Fl. Suec. 1013; Syst. Nat. 708. HUDS. Fl. angl. 418 (1762). WEISS Crypt. gott. 216 (1770). NECK. Meth. musc. 151 (1771). WITH. Bot. arr. Br. veg. 680 (1776). LIGHTF. Fl. scot. ii, 740 (1777). WEB. Sp. Fl. gott. 43 (1778). Fl. Dan. t. 473, f. 1. RELH. Fl. cant. 407 (1785). VILL. Pl. Dauph. iii, 894 (1786). HOFFM. Deutsch. Fl. ii, 55 (1796). SM. Eng. Bot. t. 426. ABBOT Fl. bedf. 244 (1798). HULL Br. Fl. P. 2, 267 (1799).

Fissidens taxifolius HEDW. Fund. musc. P. II, 91 (1782); Sp. musc. 135, t. 39, f. 1—5 (1801). ROTH Fl. germ. i, 459 (1788). RÖHL. Moosg. Deutsch. 228 (1800); Deutsch. Fl. iii, 77 (1813). P. BEAUV. Prodr. 57 (1805). SCHULTZ Fl. Starg. 292 (1806). BRID. Sp. musc. i, 168 (1806); Mant. musc. 189 (1819); Bry. univ. ii, 692 (1827). WAHLEN. Fl. Lapp. 332 (1812); Fl. carp. 342 (1814). SCHWAEGR. Suppl. I, P. II, 10 (1816). MART. Fl. cr. Erl. 110 (1817). FUNCK Moost. 33, t. 22 (1821). HUEBEN. Musc. germ. 222 (1833). DE NOT. Syll. musc. n. 115 (1838); Epil. briol. ital. 481 (1869). BR. SCHIMP. Br. eur. i, Mon. 9, t. 4 (1843); Syn. musc. 108 (1860), et 2 ed. 118 (1876). RABENH. Deutsch. Kr. Fl. ii, P. 3, 305 (1848). C. MUELL. Syn. musc. i, 50 (1849). WILS. Bry. Brit. 308, t. 16 (1855). HARTM. Skand. Fl. BERK. Handb. Br. m. 157, t. 14, f. 3 (1863). MILDE Bry. siles. 83 (1869). HOBK. Syn. Br. m. 138 (1873). HUSN. Mouss. nord-ouest 62 (1873).

Fuscina taxifolia SCHRANK Baiers. Fl. ii, 451 (1789).

Dicranum taxifolium SIBTH. Fl. oxon. 279 (1794). ROTH. Fl. germ. iii, 180 (1795). SWARTZ Musc. Suec. 31 (1799). SMITH Fl. brit. iii, 1233 (1804). TURN. musc. hib. 56 (1804). LAM. DE C. Fl. franc. i, 480 (1805). WEB. MOHR Bot. Tasch. 165 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 83, t. 37 (1810). VOIT musc. herb. 37 (1812). HOOK. TAY. Musc. brit. 51, t. 16 (1818). GRAY Nat. arr. Br. pl. i, 734 (1821). BALS. DE NOT. Pr. Bry. med. 132 (1834). MACK. Fl. hibern. P. 2, 22 (1836).

Skitophyllum taxifolium LA PYL. in DESV. Journ. Bot. 1813, p. 60, t. 35, f. 10.

Schistophyllum taxifolium BRID. MSS. LINDB.

Autoicous, (rhizautoicous); in dark green depressed tufts, fasciculate branched from base, branches suberect or decumbent, covered with numerous radicles at base. Leaves multijugous, crowded, expanded, incurved when dry, oblongo-ligulate, decreasing in size towards base and apex of stem; nerve excurrent, margin minutely hyalino-serrate; vag. lam. reaching half length, infer. lam. gradually narrowed from middle to base, not decurrent.

Fruit from near base of stem, perich. bracts ovate, concave, prolonged into a sword-shaped lamina; capsule on a longish flexuose red pedicel, cernuous or drooping, oblong, subturgid, pachydermous, rufo-fuscous, contracted below mouth when dry; lid convex at base, with a long curved beak, calyptra cucullate. Male infl. on short rooting ramuli, bracts ovate, concave, pointed; antheridia 2—3, without paraphyses.

HAB.—On clay banks in woods, damp fields, and by road-sides. Fr. 10—12.

Varying little, except in size, and readily known by the absence of thickened border, crenulate margin, and excurrent nerve, and when fertile, by the radical perichætia.

12. FISSIDENS ADIANTOIDES (*L.*) *Hedw.*

Autoicous; stem erect, branched; leaves oblongo-lanceolate, acute, serrulate above; seta from middle of stem, capsule ovate, lid long-beaked. (T. XII, B.)

SYN.—*Muscus filicifolius seu pennatus aquaticus maximus.* RAY Synops. stirp. Brit. 2 ed. 35, n. 2 (1696).

Hypnum erectum filicifolium ramosum, pinnulis acutis. DILL. in RAY Synops. 3 ed. 87, n. 39 (1724).

Hyp. taxiforme palustre ramosum, majus et erectum. DILL. Hist. musc. 264, n. 3, t. 34, f. 3 (1741); et Herb.

Hyp. adiantoides L. Sp. pl. ii, 1123 (1753); Syst. nat. ii, 703; Syst. Veg. 950. HUDS. Fl. angl. 419 (1762). NECK. meth. musc. 153 (1771). WITH. Bot. arr. Br. veg. 681 (1776). LIGHTF. Fl. Scot. ii, 742 (1777). WEB. Spic. Gott. 48 (1778). RELH. Fl. cant. 408 (1785). VILL. Pl. Dauph. iii, 894 (1786). SM. Eng. bot. t. 264 (1795). HOFFM. Deutsch. Fl. ii, 55 (1796). ABBOT Fl. bedf. 244 (1798). HULL Br. Fl. P. 2, 268 (1799).

Fissidens adiantoides HEDW. Fund. Musc. P. II, 91 (1782); Musc. frond. 61, t. 26 (1792). ROTH Fl. germ. i, 459 (1788). BRID. Musc. rec. ii, P. I, 145 (1792); Sp. musc. i, 171 (1806); Mant. musc. 191 (1819); Bry. univ. ii, 702 (1827). RÖHL. Moosg. Deutsch. 295 (1800); Deutsch. Fl. iii, 77 (1813). P. BEAUV. Prodr. 57 (1805). SCHULTZ Fl. Starg. 292 (1806). SCHWAEGR. Suppl. I, P. II, 10 (1816). MART. Fl. cr. erl. 109 (1817). FUNCK Moost. 33, t. 22 (1821). HUEBEN. Musc. germ. 224 (1833). DE NOT. Syll. musc. n. 114 (1838); Epil. briol. ital. 478 (1869). BR. SCHIMP. Bry. eur. i, Mon. 10, t. 5 (1843); Syn. musc. 108 (1860) et 2 ed. 119 (1876). RABENH. Deutsch. Kr. Fl. ii, P. 3, 306 (1848). C. MUELL. Syn. musc. i, 51 (1849). WILS. Bry. Brit. 307, t. 16 (1855). HARTM. Skand. Fl. BERK. Handb. Br. m. 156, t. 14, f. 2 (1863). MILDE Bry. siles. 83 (1869). HOBK. Syn. Br. m. 137 (1873). HUSN. Mouss. nord-ouest 63 (1873).

Dicranum adiantoides SIBTH. Fl. oxon. 280 (1794). ROTH. Fl. Germ. iii, 184 (1795). SWARTZ Musc. Suec. 31 (1799). SMITH Fl. Brit. iii, 1234 (1804). TURN. Musc. hib. 57 (1804). LAM. DE C. Fl. franc. i, 480 (1805). WEB. MOHR Bot. Tasch. 164 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 83, t. 37 (1810). VOIT Musc. herb. 36 (1812). HOOK. TAYL. Musc. brit. 51, t. 16 (1818). GRAY Nat. arr. Br. pl. i, 733 (1821). BALS. DE NOT. Pr. Bry. med. 131 (1834). MACK. Fl. hibern. P. 2, 22 (1836).

Fiss. taxifolius Var. *β.* WAHLEN. Fl. Lapp. 332 (1812).

Skitophyllum adiantoides LA PYL. in DESV. Jour. Bot. 1813, p. 55, t. 36, f. 15.

Schistophyllum ad. BRID. MSS. LINDBERG.

Autoicous; in large bright green or yellowish green tufts. Stems 1—5 in. high, generally prostrate at base, with subfasciculate branches, which are radiculose at base. Leaves multijugous, flattened or subsecund, crowded and covering each other at base, oblong and oblongo-ligulate, suddenly acuminulate; nerve vanishing in the apex; all margin

minutely serrulate, toward apex eroso-denticulate with larger and smaller teeth; vag. lam. above half length of leaf; inferior lam. rather broad, with a rounded, non-decurrent base; areolation rather lax, rounded-subhexagonal, in the old leaves in a broad paler or yellowish border of rather larger cells. Capsules from middle of stem, on a long red pedicel, cernuous or horizontal, oval-oblong, pachydermous, rufo-fuscous, when dry and empty, strongly contracted below the mouth; calyptra cucullate, lid long-beaked, about length of capsule; teeth purple, narrowly trabeculate externally, lamellose internally. Perich. bracts broadly ovate with a sword shaped vertical lamina. Male infl. on the stem near the female, small, axillar, gemmiform, bracts broadly ovate, abruptly apiculate, antheridia few, oblong, minute, without paraphyses.

HAB.—Shady wet banks and heaths, subalpine rocks, and at base of walls. Not uncommon. Fr. 12.

This well-known moss varies considerably in size and colour according to the locality, in dry places being only half an inch high, and of a yellow-rufous tint, in wet places deep green and approaching *F. polyphyllus* in size; it occurs at a considerable altitude on the mountains.

13. FISSIDENS POLYPHYLLUS *Wils.*

Dioicous; tall, scarcely branched; leaves crowded, elongato-lanceolate, not bordered, entire, nerved to apex; seta lateral, very short, capsule cylindraceous, cernuous. (T. XII, C.)

SYN.— *Fissidens polyphyllus* WILS. in lit. BRUCH. SCHP. Bry. eur. vi, Mon. Suppl. T. III. (1851); Syn. musc. 109 (1860), et 2 ed. 121 (1876). BERK. Handb. Br. m. 158 (1863).

F. asplenioides var. *β. polyphyllus* WILS. Bry. Brit. 306, t. 53 (1855). HOBK. Syn. Br. m. 137 (1873).

F. adiantoides p. p. C. MUELL. Syn. Musc. i, 51.

F. Welwitschii SCHIMP. Syn. Musc. 2 ed. 120 (non Duby).

F. polyphylloides SAUERB. in Adumb. Musc. ii, 658 (1879).

Dioicous; stems 3—12 in. long, erect or declinate at base, simple or sparingly branched, tomentose with rufous radicles. Leaves crowded, erecto-patent, flattened or secund, somewhat twisting at apex and flexuose when dry, elongato-lanceolate, not bordered, minutely crenulate at extreme point, nerve lost just below it; vag. lam. reaching beyond middle, infer. lam. gradually narrowed towards base, not decurrent, areolation minute, rounded-hexagonal, with large chlorophyl granules, that of vag. lam. laxer and larger.

Female plant small, 1½ in. high, seta about ⅛ in. long, erect, arising near the top of stem; capsule inclined or horizontal, pachydermous, chestnut brown, cylindraceous, narrowed at base into a neck; teeth of peristome firm, orange red, erect, rather short, cleft half way into two

slender, unequal, nodulose legs; perich. bracts about 5, ovate, sheathing, with an elongated sword-shaped lamina. Male plant about 2 in. high, with longer leaves, the infl. axillary, numerous, 8-leaved, outer bracts small, ovato-lanceolate, inner from an obovate base, suddenly passing into a narrow, linear, nerved, flexuose lamina, antheridia large, numerous, with few paraphyses.

HAB.—Wet shady rocks.

Glengariff, Ireland (*Wilson* 1829)! Pont Aberglaslyn on the right of the road to Tremadoc, N. Wales (*Wilson* 1838)!! Well and river side at Treveylor, Penzance (*Curnow* 1866)!! Banks of the Dart, Holne bridge, S. Devon (*Marquand* 1884).

This fine moss was first distinguished by Wilson, but afterwards he referred both it and *F. serrulatus* to the West Indian *F. asplenioides* SWARTZ. The very interesting discovery of the fruit has confirmed its distinctness, and I am indebted to the kindness of M. Husnot for the opportunity of figuring a specimen, though, unfortunately, without operculum. It was found in the "Brèche de Toul-an-Dioul," near St. Rivoal, Dep. of Finistère by M. Camus in June, 1878. A form occurs in the Beddgelert locality with the leaves somewhat falcato-secund.

Since the above monograph was issued, an important paper by Mr. Mitten has appeared in Journ. Linn. Soc. Bot. XXI, 550 (1885), which adds considerably to our list of species, and alters many of the older views. This necessitated a fresh study of these mosses, and as Mr. Mitten has kindly supplied me with most of his types, I have taken the opportunity of drawing them on an additional plate and again enumerating our species, with remarks where my conclusions differ from those of the talented author. A good paper on the American species, by Mr. C. R. Barnes, of Purdue University, Lafayette, has also appeared in the Botanical Gazette for January and February, 1887. It must be remembered that the optical aids to examination at the end of last century were of a very primitive kind and limited in use, hence we need not be surprised that among the minute sorts, various species were distributed under the same name, because there were no means of certainly distinguishing them, hence we think too much stress must not be laid on herbarium specimens as types of species.

The principal characters in Mr. Mitten's arrangement are, 1. the position of the male inflorescence,—2. the erect symmetric, or inclined unequal capsule,—3. the presence or absence of a hyaline limb to the laminæ of leaf. Among the small species of *Fissidens*, and in some of the larger, we have come to the conclusion that the position of the inflorescence is most variable, and affords no stable specific character, as indeed Mr. Mitten states, though the key conveys a different impression; nor is much value to be attached to the erect or inclined position of the capsule, for both certainly occur in the same species, though the symmetric or asymmetric form, if well marked, may prove more reliable, but with respect to the limb bordering the leaves, we attach more weight to it, as constituting a character of importance in the structure of the leaf, and undoubtedly of great value in discriminating species of such genera as *Mnium* and *Bryum*.

1. FISSIDENS EXILIS *Hedw.*

SYN.—*Fissidens exilis* HEDW. l. c. HUSN. Muscol. gall. 48, t. 15 (1884).
Fissidens Bloxami WILS. l. c. MITT. Journ. Linn. Soc. Bot. xx., 558 (1885).

This no doubt was mixed up with *F. viridulus* and *pusillus* by the older botanists, but Hedwig had the true plant as his remark on the leaves testify, and he also sent specimens of it to Starke still preserved in his herbarium (fide Limpricht).

2. FISSIDENS EXIGUUS *Sulliv.*

Dioicous; very small. Leaves 4—6-jugous, oblongo-lanceolate, uppermost longer, not limbate or only faintly on the vaginant lamina, nerved nearly to apex. Caps. erect, oblong-oval, lid conic-rostellate. (T, XII.* E.)

SYN.—*Fissidens exiguus* SULLIV. in Mem. Amer. Acad. n. ser. iii, p. 60, t. 2 (1848). Musc. Allegh. n. 182. Mosses Un. st. 24 (1856). Icones musc. 36, t. 23 (1864). LESQ. JAMES Mosses N. Amer. 84 (1884). MITT. Journ. Linn. Soc. Bot. xxi, 557 (1885).

Fissidens viridulus Var. *Lylei* WILS. Bry. br. 304.

Fissidens pusillus β. *Lylei* BRAITHW. ante p. 68.

Fissidens incurvus Var. *exiguus* AUSTIN Musc. appalach. n. 103. BARNES Bot. Gaz. 1887, p. 6.

Dioicous or autoicous; very minute, densely gregarious, yellow-green. Leaves 4—6-jugous, recurved when the stem is declinate at base, oblong-lanceolate, rather suddenly acute-pointed, accrescent upward, immarginate or with a faint limb to the duplicate lamina or also to lower part of the other laminæ, inferior lam. narrowing downwards and vanishing at base; cells rounded. Caps. erect or slightly inclined, oblong-oval, somewhat contracted below the mouth, lid conic, rostellate. Male plant minute, short, bracts two, with a short ensiform lamina.

HAB.—Stones in damp shady places. Fr. 9—2.

Tilgate forest, on clinkers with *F. incurvus* (*Mitten*)!! Henfield (*Mitten*). The form *Lylei*, Witney, Oxon (*Boswell*, 1878)!! &c.

3. FISSIDENS MINUTULUS *Sulliv.*

Dioicous and autoicous; very small. Leaves 5—8-jugous, upper long, linear-lanceolate, acute, all narrowly limbate, nerved to apex. Caps. erect or inclined oblong, lid conic, rostrate. (T. XII,* F.)

SYN.—*Fissidens minutulus* SULLIV. in Mem. Amer. acad. n. ser. iii, p. 58, t. 2 (1848). Musc. Allegh. n. 183. Mosses Un. St. 24 (1856). Icon. Musc. 37, t. 24 (1864). LESQ. JAMES Mosses N. Amer. 85 (1884). MITT. Journ. Linn. Soc. Bot. xxi., 556.

Fissidens bryoides Var. 1 & 2. HOOK. WILS. in Drumm. Musc. Amer. Coll. 2, n. 39 & 40.

Fissidens pusillus Var. *madidus* SPRUCE in Journ. Bot. 1880, p. 361. BRAITHW. ante p. 68.

Fissidens incurvus Var. *minutulus* AUSTIN Musc. Appalach. n. 102. BARNES Bot. Gaz. 1887, p. 5.

Dioicous and autoicous; minute, bright green. Leaves more numerous, narrowly limbate, lower very small, upper longer, obliquely oblongo-lanceolate or linear, acute and long-pointed, nerved to apex, inferior lam. vanishing above the base, cells rounded, denser. Caps. erect or inclined, oval-oblong, rather narrow; lid conic, obliquely rostrate, nearly as long as caps. Male on a long basal branch or on separate plants.

HAB.—Dripping stones. Fr. 10—11.

Castle Howard and Mowthorpe Dale (*Spruce*)!! Stirrup wood (*Gordon, Ashton* and *Nield* 1871). Marple, Cheshire (*Whitehead* 1871). Levens (*Dr. Wood* 1871).

A beautiful little moss of bright green colour, and distinct habit, which has also been found in Scandinavia.

4. FISSIDENS VIRIDULUS (*Swartz*) *Wahl.*

Ante p. 70. HUSN. Muscol. gall. 50, t. 15 (1884).

Fissidens pusillus WILS. ante p. 68. SPRUCE in Journ. Bot. 1880, p. 360. HUSN. op. c. 49, t. 15.

Fissidens synanthus MITT. Journ. Linn. soc. Bot. xxi, 554 (1885).

Fissidens exilis MITT. op. c. 555.

Fissidens holomitrius SPRUCE Journ. Bot. 1880, p. 356.

Fissidens sepincola MITT. in lit.

Synoicous, autoicous or dioicous; varying also in size and in the direction of the capsule, which is however more or less symmetric. Mr. Mitten's specimens of *F. sepincola* sent to me are *F. exilis* of this work. In *F. synanthus* not one-half of the specimens are synoicous, the male infl. being basal or on a separate plant.

5. FISSIDENS INCURVUS *Starke.*

Ante, p. 69. JURATZ. Laubm. oesterr.-ung. 61 (1882). HUSN. Musc. gall. 49, t. 15 (1884). LESQ. JAMES Mosses N. Amer. 82 (1884). MITT. Journ. Linn. soc. Bot. xxi, 557.

Fissidens Bambergeri SCHIMP. Synops. 2 ed. 115 (1876). HUSN. l. c. MILDE in Bot. Zeit. 1864, Beil. p. 12.

Var. *β.* **tamarindifolius** (*Don*). Ante, p. 69.

Fissidens tamarindifolius MITT. Journ. Linn. soc. xxi, 557 (1885).

Oakwood, Romiley, Cheshire and Ashton (*Scholefield* and *Whitehead*). Charlesworth, Derby (*Whitehead*).

6. FISSIDENS TEQUENDAMENSIS *Mitt.*

SYN.—*Fissidens Tequendamensis* MITT. Journ. Linn. soc. Bot. xii, 601 (1869).

Fissidens Orrii LINDB. Ante, p. 73.

The Irish plant is identical with Weir's from the Andes of New Granada, and adds another to the group of species common to these two distant regions of the world. It is very close to *F. Algarvicus* SOLMS, which has a similar minute capsule and long seta, and leaves of the same form, but with denser oval cells.

7. FISSIDENS BRYOIDES (*L.*) *Hedw.*

Ante, p. 71. JURATZ. Laubm. oesterr.-ung. 60. HUSN. Muscol. gall. 47, t. 14 (1884).

Var. *β.* **intermedius** *Ruthe.*

Leaves more oblong, with broader points suddenly acutate, and narrower border, the imfer. lam. vanishing at or below the middle of the vag. lam. (T. XII.* D.)

SYN.—*Fissidens bryoides* Var. *exilis* SCHIMP. Bry. eur. fasc. 42, Suppl.
F. bryoides Var. *intermedius* RUTHE in RABENH. Bryoth. eur. n. 1160 (1872).
Fissidens impar MITT. Journ. Linn. soc. Bot. xxi, 554 (1885).

HAB.—Three bridges, Sussex (Mitten 1845)!! Botanic Garden, Dublin (Moore).

This variety evidently forms part of Hedwig's figures of *F. bryoides* in Musc. frond. iii, t. 29, and the specimen from Mr. Mitten, which I have figured, has no axillar ♂ infl. but it is radical on a very short branch, and Ruthe states it also occurs as naked antheridia in the upper axils as well as on separate plants.

8. FISSIDENS CURNOWII *Mitt.*

Autoicous; robust, pale green. Leaves multijugous, long, lanceolate, narrowly limbate. Caps. short, inclined, ovate-oblong, pale; lid conic-rostellate. (T. XII* G.)

SYN.—*Fissidens bryoides* var. *cæspitans* SCHIMP. ante, p. 72. HUSN. Musc. gall. 47, t. 14 (1884).
Fissidens Curnowii MITT. Journ. Linn. soc. Bot. xxi, 556.

Autoicous; in dense extended matted tufts, interwoven with long purple radicles, pale green, glaucescent. Stems ½—1½ in. high, erect, sparingly branched. Leaves 10—20-jugous, long linear-lanc. thin, the limb strong, vanishing below the apex, which is sometimes minutely serrate. Caps. small, inclined, leptodermous, pale greenish-brown, on a red seta, ovate or oblong; lid conic, rostellate, acute. Male infl. axillary.

HAB.—Coast about Penzance (*Curnow*)!! Lundy island and Lyme regis (*Mitten*). Bolton woods, Yorks. (*Wild* 1876). Tyn-y-groes (*Holt*).

Although this moss comes very near *F. bryoides*, its general habit and texture are so different that I have followed Mr. Mitten in regarding it as a species, though probably it is connected with *F. bryoides* by intermediate forms.

9. FISSIDENS FONTANUS *Schimp.*

Dioicous or autoicous; tall, dull lurid green. Leaves multijugous, lineal-lingulate, the limb stout, vanishing below apex. Caps. erect, lid conico-rostellate. (T. X, D, *β.*)

SYN.—*Fissidens incurvus* var. β. *fontanus* BR. SCH. Bry. eur. fasc. 17, Mon. 7, t. 1 (1843).

Fissidens crassipes WILS. JURATZ. Laubm. oesterr.-ung. 62 (1882). LESQ. JAMES Mosses N. Amer. 83 (1884).

Fissidens mildeanus SCHIMP. in litt. MILDE in RABENH. Bryoth. n. 470. Bot. Zeit. 1862, p. 459. DE NOT. Epil. bri. ital. 482.

Fissidens viridulus var. *fontanus* ante p. 71.

Fissidens fontanus SCHIMP. MITT. Journ. Linn. soc. Bot. xxi, 556.

Dioicous or autoicous; dull lurid green. Stems weak ½—2 in. high, flexuose, ascending. L. succulent, lineal-lingulate, acuminate, limb thick, yellow, unequal, vanishing with the nerve below the irregularly crenulate apex; cells larger. Caps. suberect, ovate, contracted below the mouth when dry, narrowly annulate, on a stout yellow-red seta; lid conico-rostellate.

Ilkley (*Dr. Carrington* 1855). Ravensdale and Monsal dale (*Holt* 1883). More allied to the next species than to *F. viridulus*.

10. FISSIDENS RIVULARIS *Spruce.*

Autoicous; robust, dark green. Leaves multijugous, elongate-lineal, with a very thick border confluent at apex with the nerve. Caps. cernuous, oval, lid conico-rostellate. (T. XII*, A.)

SYN.—*Fissidens bryoides* var. *rivularis* SPRUCE Musc. pyren. n. 318 (1847); Trans. Bot. soc. Edin. iii, 193 (1849). Journ. Bot. 1880, p. 359.

Fissidens rivularis SCHIMP. Bry. eur. fasc. 46-47 Suppl. 2 (1851). Synops. 105 (1860), 2 ed. 114. HUSN. Musc. gall. 47, t. 15 (1884).

Fissidens pyrenaicus SPRUCE Trans. Bot. soc. Edin. 1849, p. 194.

Autoicous; dark lurid green, cæspitant, plants ½—1 in. high, divided at base or sparingly branched. Leaves 12—20-jugous, crowded, patulous, rather rigid, elongate-lineal, with a thick limb confluent at apex with a stout nerve in a blunt apiculus, infer. lam. vanishing at base, cells round, dense, chlorophyllose. Caps. on a short slender pale terminal seta, cernuous, becoming erect when old, small, oval, leptodermous, pale fuscous, exannulate, lid conic, shortly rostrate, red. Male infl. axillar, very numerous, gemmaceous, minute, bracts 3, very thin, lax, the upper lam. forming an apiculus.

HAB.—On stones wet with spray. Fr. 8—9.

On a rock in Fairlight glen, Hastings (*Holmes* 1884)!!

An excellent species, and a fine addition to our flora, remarkable for the very short slender seta, which is often curved and flexuose.

11. FISSIDENS RUFULUS *Schimp.*

Ante p. 74. Also found on stones in the R. Wharfe, Bolton bridge (*West*)!! and Glynhir, Caermarthen (*Rev. A. Ley* 1879).

12. FISSIDENS OSMUNDOIDES (*Swartz*) *Hedw.*

Ante p. 73. Found richly in fruit at Kinder Scout (*Whitehead* and *Holt* 1883). Tintwistle, Cheshire (*Whitehead*).

13. FISSIDENS SERRULATUS *Brid.*

Ante p. 75. HUSN. Musc. gall. 52, t. 16 (1884). BOTTINI Ricerche briol. nell'Isola d'Elba 25 (1886).

Fissidens Langei DE NOT. MITT. Journ. Linn. soc. Bot. xxi, 559.

The Marquis Bottini, in the paper quoted, has exhausted the subject of the various forms of this species, and shown conclusively that *F. Langei*, which is the British form, must be retained under *F. serrulatus*, having also terminal setæ, and differing only by its papillose leaves with a colored margin of about 4 rows of cells, but which is variable in tint and extent. He also regards *F. polyphyllus* as a variety, a view with which at present we do not coincide.

14. FISSIDENS TAXIFOLIUS (*L.*) *Hedw.*

Ante p. 77. MITT. op. c. 558.

15. FISSIDENS CRISTATUS *Wils.*

SYN.—*Fissidens cristatus* WILS. in Kew Journ. Bot. ix, 294 (1857). MITT. Journ. Linn. soc. i, Suppl. 137 (1859).

Fissidens decipiens DE NOT. ante p. 76. HUSN. Musc. gall. 51, t. 16 (1884). BARNES in Bot. Gaz. 1887, p. 27.

Fissidens adiantoides MITT. in Journ. Linn. soc. Bot. xxi, 559 (1885).

Although Mitten refers this species to *F. adiantoides* of Hedwig, I look upon that name as already occupied by the plant of Linnæus, certainly the same as that usually so called; and although Hedwig's figure does look more like the present plant, I do not think it conclusive, for *F. adiantoides* (L.) is usually dioicous. Dr. Spruce finds a tall form with distant narrow, slightly crisped leaves, growing on grassy hillocks under shade of *Rosa spinosissima* at Coneysthorpe, which is identical with one found in Bhotan by Wallich. The species is widely distributed throughout the whole northern hemisphere.

Var. *β*. **brevifolius** *Lindb.*

Leaves dense, about half the length of those in the typical form, the serratures less distinct or almost obsolete, the pale border narrower.

HAB.—Near O'Sullivan's hotel, Killarney (*Lindberg* 1873)!!

16. FISSIDENS ADIANTOIDES (*L.*) *Hedw.*

Ante p. 78. JURATZ. Laubm. oesterr.-ung. 65. HUSN. Musc. gall. 52, t. 16.

Fissidens majus MITT. Journ. Linn. soc. Bot. xxi, 559 (1885).

Var. *β* **collinus** *Mitt.*

Autoicous; short, tufted ½—1½ in. high, erect.

SYN.—*Fissidens adiantoides* β. *marginatus* BRID. Bry. univ. ii, 704 (sec. Schimper).
Fissidens collinus MITT. in Journ. Linn. soc. Bot. xxi, 559.

HAB.—Chalk downs among short grass. Fr. 12. Woolsonbury hill (*Mitten*)!! Tring (*Holmes*)!!

This is the *small form* alluded to in the Bryologia europæa, and I do not find the slightest difference in the cells from those of F. *adiantoides*, which is, however, more frequently dioicous than autoicous. See MILDE (48 Jahresbericht d. Schles. Ges. p. 131) 1870.

17. FISSIDENS POLYPHYLLUS *Wils.*

Ante p. 79. BOULAY in Rev. bryol. 1885, p. 50.
HUSN. Musc. gall. 52, t. 16 (1884). MITT. Journ. Linn. soc. Bot. xxi, 559 (1885).
F. serrulatus Var. *polyphyllus* BOTTINI Rich. briol. nell'is. d'Elba 32 (1886).

Boulay as well as Bottini regards this species as a northern variety of *F. serrulatus*.

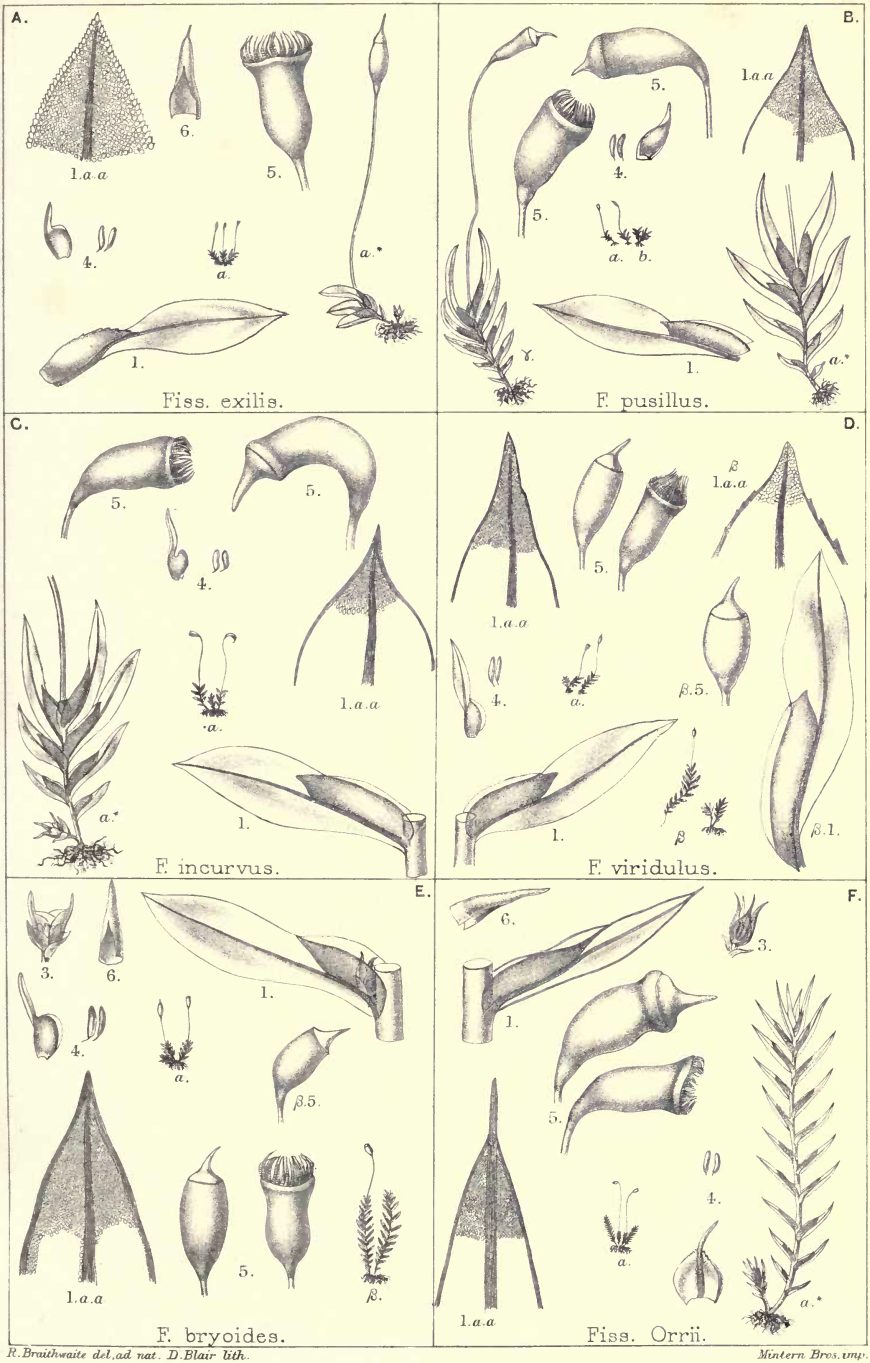
TAB. X. A. *Fissidens exilis* (Keston, *Braithwaite*). B. *Fiss. pusillus* (Hill cliff dingle, *Wilson*). γ. *Fiss. minutulus* (Castle Howard, *Spruce*). C. *Fiss. incurvus* (Durdham downs, *Miss Attwood*). D. *Fiss. viridulus* (Ecclesbourne, *Holmes*). β. *Fiss. fontanus* (Oxford, *Boswell*). E. *Fiss. bryoides* (Woodford, *Braithwaite*). β. *Fiss. Curnowii*. F. *Fiss. tequendamensis* (Tolka river, *Orr*).

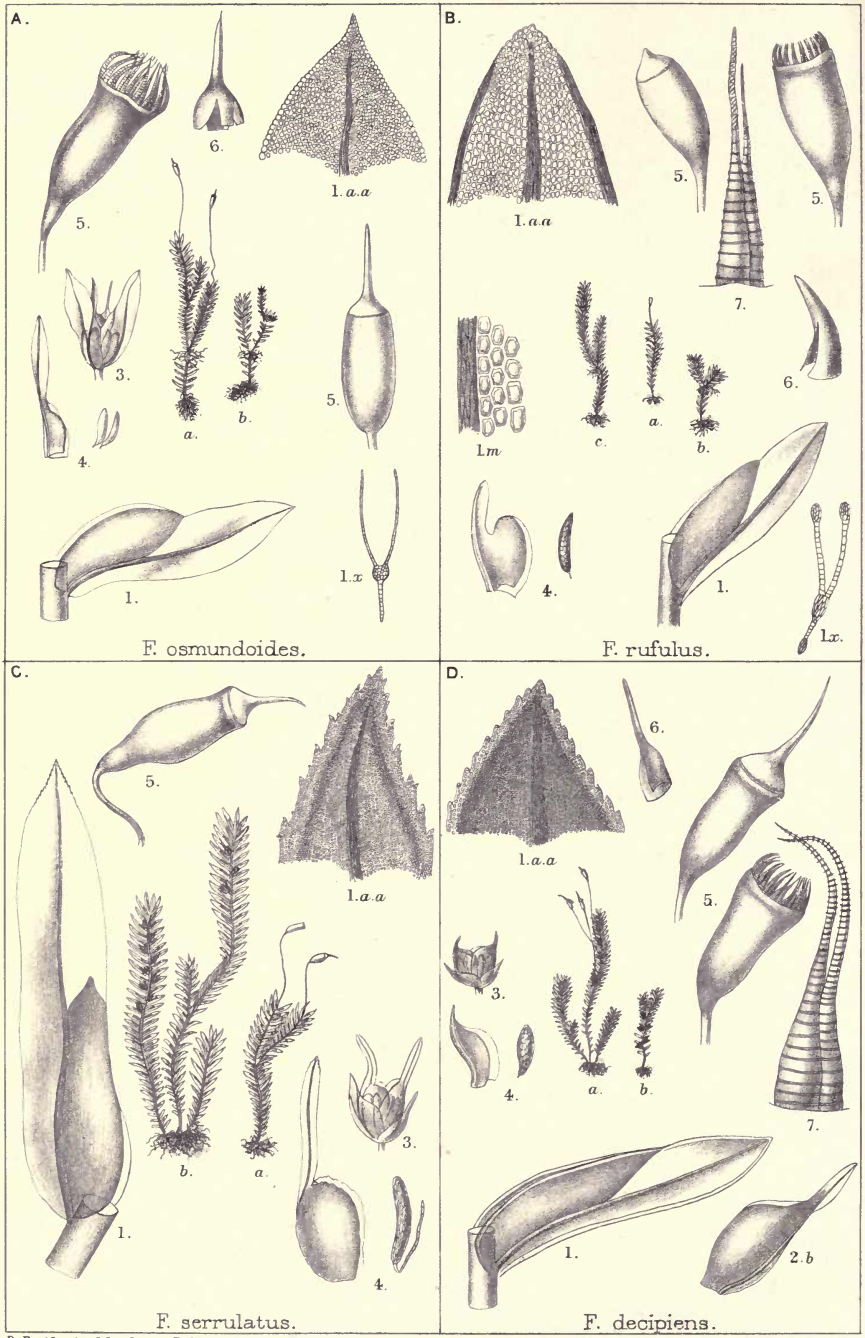
TAB. XI. A. *Fiss. osmundoides* (Longfield moor, *Nowell*). B. *Fiss. rufulus* (Rigmaden Park, *Dreesen*). C. *Fiss. serrulatus* (Teneriffe and Penzance, *Curnow*). D. *Fiss. cristatus* (Rayrigg, *Barnes*).

TAB. XII. A. *Fiss. taxifolius* (Hastings, *Braithwaite*). B. *Fiss. adiantoides* (Knutsford moor, *Hunt*). C. *Fiss. polyphyllus*. a. Finistêre (*Camus*). b. Glengariff, (*Wilson*). c. (Penzance, *Curnow*).

TAB. XII*. A. *Fiss. rivularis* (Hastings, *Holmes*). B. E. *Fiss. exiguus* (Sussex, *Mitten*). C. *Fiss. viridulus* (Hurst, *Mitten*). D. *Fiss. bryoides* β. (Sussex, *Mitten*). F. *Fiss. minutulus* (Castle Howard, *Spruce*). G. *Fiss. Curnowii*, (Penzance, *Curnow*). H. *Fiss. incurvus* β. (Ashley, *Hunt*). I. *Astomum mediterraneum* (Isle of Man, *Holt*).

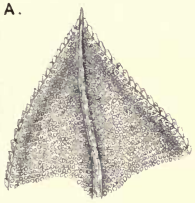
a. Fertile plant. a*. Ditto mag. b. Male. c. Sterile plant. 1. Leaf mag. 1x. Trans. section. 1aa. Apex and areolation. 2. Perichætium. 3. Male infl. 4. Bract and antheridia. 5. Capsule. 6. Calyptra. 7. Tooth of peristome.

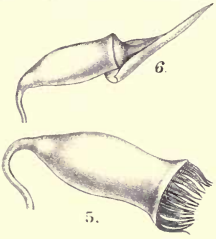

A.
1.a.a
6.
5.
4.
a.
a.*
1.
Fiss. exilis.
B.
1.a.a
5.
4.
5.
a. b.
γ.
1.
a.*
F. pusillus.
C.
5.
5.
4.
1.a.a
a.
a.*
1.
F. incurvus.
D.
β
1.a.a
5.
1.a.a
4.
a.
β.5.
1.
β
β.1.
F. viridulus.
E.
3.
6.
1.
4.
a.
β.5.
1.a.a
5.
β.
F. bryoides.
F.
6.
3.
1.
5.
4.
a.
1.a.a
a.*
Fiss. Orrii.

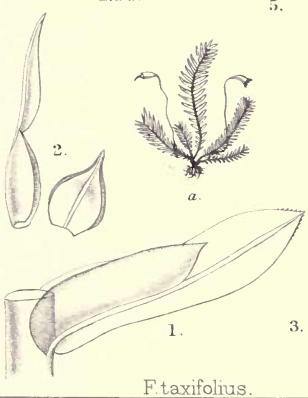


R. Braithwaite del. ad nat. D. Blair lith. Mintern Bros. imp.

A.

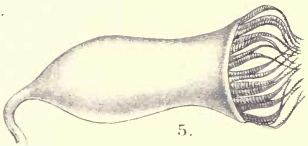


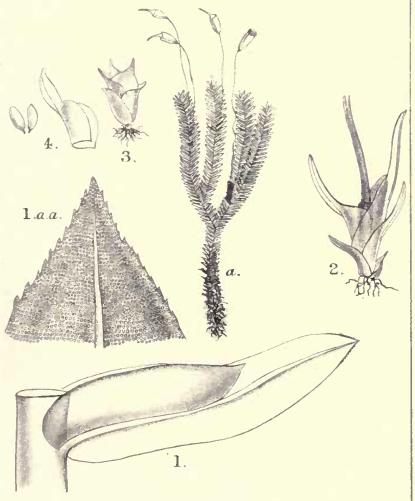




F. taxifolius.

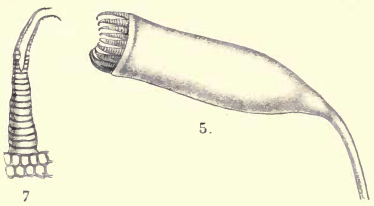
B.

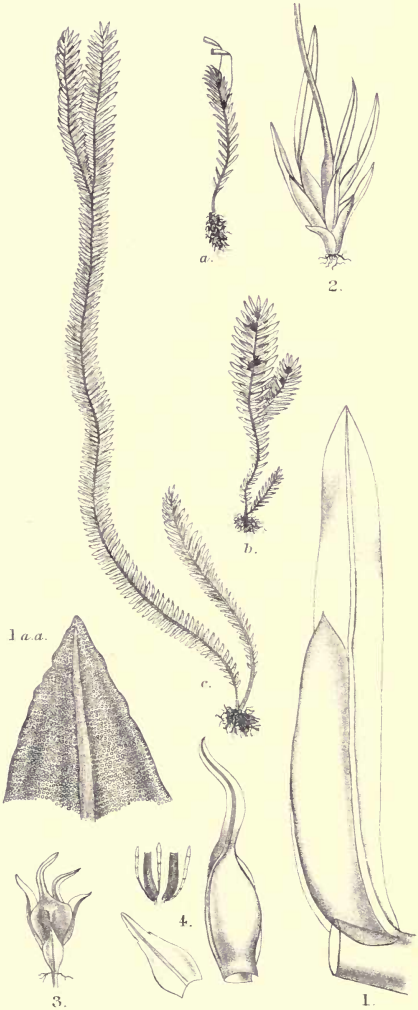




F. adiantoides.

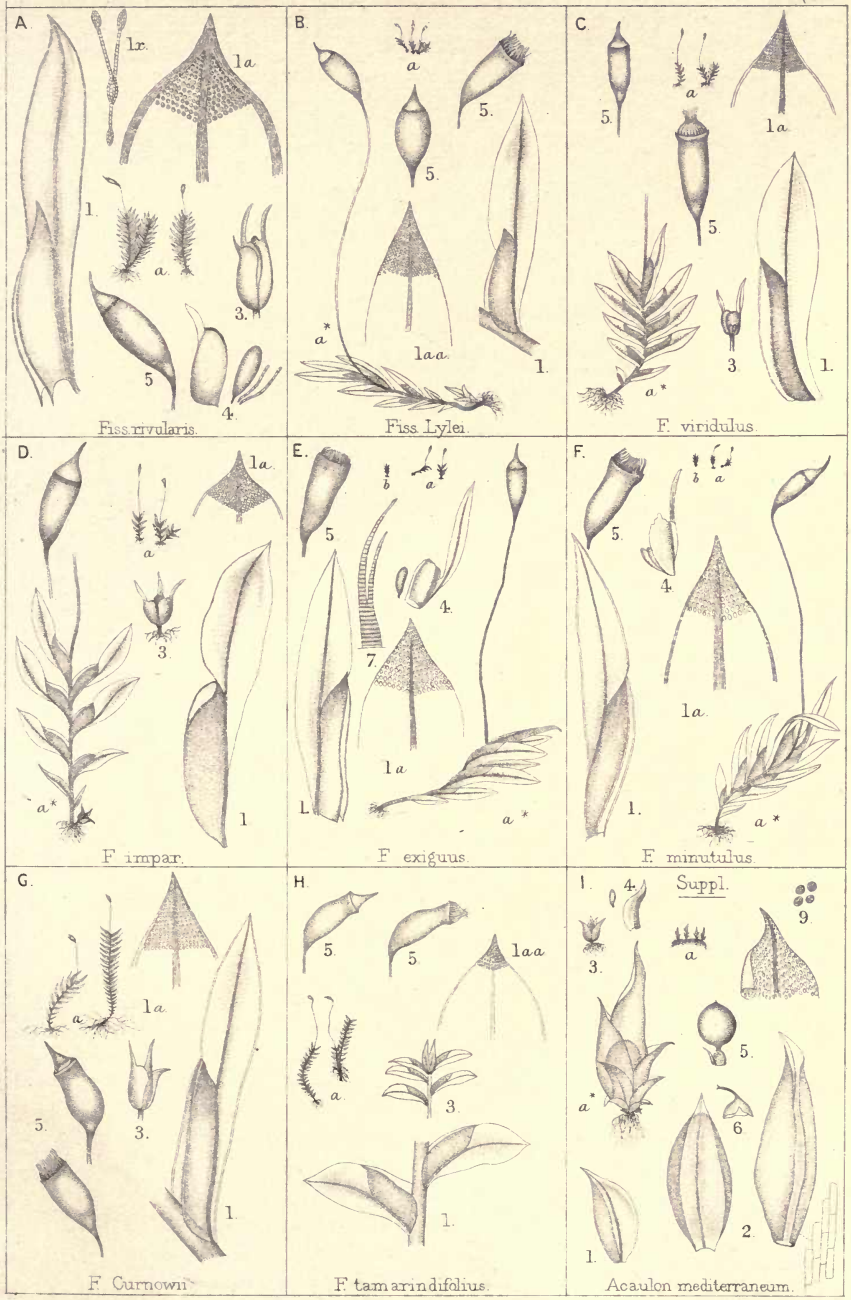
C.





F. polyphyllus.

R. Braithwaite del. ad nat. D. Blair lith. Mintern Bros. imp



R. Braithwaite ad nat. del. E. Carter sc.

Mintern Bros imp

LEUCOBRYACEÆ.

OCTOBER 1ST, 1881.

LEUCOBRYUM Hampe.

1. **L. glaucum** (*L*) *Schimp.*

† † ELEUTHEROPHYLLEÆ.

Leaves in several rows, inserted horizontally, free from adnate stipules.

Fam. 6. LEUCOBRYACEÆ.

Mosses of a pale glaucous green colour, white and brittle when dry, growing in dense spongy tufts. Leaves in many rows, lanceolate, concave, composed almost entirely of the dilated nerve, which consists of several layers of empty parenchymatous cells, with their internal walls perforated by foramina, and a central series of 3-4-angled, chlorophyll-lose duct-like cells. Capsule oblong, cernuous or erect; peristome resembling that of *Dicranum*, of 16 or 8 teeth.—Inhabiting the ground or rotten wood.

The very striking plants referred to this family are almost entirely tropical, and are remarkable for their pale colour, and the composite structure of their leaves, compared by some authors to that of *Sphagnum*, to which however they are not allied. The family was established by Hampe, and named Leucophaneæ, but was altered by C. Mueller to Leucobryaceæ to accord with the principal genus, and comprises about 65 species, nearly half belonging to *Leucobryum*, the other genera being *Leucophanes*, *Schistomitrium* and *Octoblepharum*. Our British species is the sole representative in Europe, and in the other three quarters of the globe seems to be replaced by the equally common *Octoblepharum albidum*. Lindberg reunites the family to Dicranaceæ, as he finds that the leaves of *D. albicans* and *longifolium* in section, quite resemble in structure those of *Leucobryum*. The leaves have generally been described as nerveless, but it is more correct to regard them as consisting almost entirely of nerve, for careful observation will show that near the base, there is at the edges a very narrow but distinct lamina of only a single stratum of narrow elongated cells. On the terminal leaves of the stem of female *Leucobryum glaucum*, it is common to find a minute tuft of radicular tomentum developing a cluster of young plants, which falling to the ground grow to a new colony, and thus compensate for the rarity of the fruit. Mr. Barnes tells me that it is difficult to keep the lids on the capsules, as the moss continues its growth even in the press, and to prevent this he recommends those who are fortunate enough to find it in fruit, to dip it into boiling water before pressing.

LEUCOBRYUM HAMPE.

(Regensb. Bot. Zeit. 1837, I, 282.)

Densely cæspitose mosses of a whitish or glaucous colour, with dichotomous and fastigiate ramification. Calyptra dimidiate, cucullate. Capsule pachydermous, unequal, often strumose, plicate when dry,

terminal or lateral by innovation; peristome of 16 teeth, bifid and trabeculate as in *Dicranum*. Leaves composed of 2 or more strata of large empty rectangular parenchymatous cells, having their internal walls perforated by large circular foramina, and a central series of narrow quadrangular chlorophyllose cells. Terrestrial, on heaths and in woods. —Deriv. λευκος white, βρυον a moss.

LEUCOBRYUM GLAUCUM (*L.*) *Schimp.*

Dioicous; densely compacted, whitish, glaucous. Leaves crowded, erecto-patent, entire, broadly lanceolate, cuspidate, with incurved margins; perichætial convolute, acuminate. Capsule oval, cernuous, strumose, sulcate, lid with a long oblique subulate beak. (T. XIII.)

SYN.—*Muscus trichoides montanus albidus fragilis* DOODY. RAY Synops. stirp. brit. 2 ed. app. 339 (1696). MORIS. Hist. oxon. iii, 630, S. xv, t. 6. fig. 22 (1699).

Bryum trichoides, erectis capitulis, albidum fragile DILL. Cat. Giss. 225 (1719); et in RAY Synops. 3 ed. 97, n. 29 (1724).

Bryum albidum et glaucum fragile majus, foliis erectis, setis brevibus DILL. Hist. musc. 362, T. 46, fig. 20 (1741); et herb.

Bryum glaucum L. Sp. pl. ii, 1118 (1753); Syst. Nat. ii, 701. HUDS. Fl. angl. 407 (1762). NECK. Meth. musc. 226 (1771). WITH. Bot. arr. Br. Veg. ii, 673 (1776). LIGHTF. Fl. Scot, ii, 723 (1777). Fl. Dan. t. 824, fig. 3 (1780). HOFFM. Deutsch. Fl. ii, 38 (1796). ABBOT Fl. Bedf. 239 (1798). HULL Brit. Fl. P. 2, 263 (1799).

Hypnum glaucum WEISS Cr. gött. 208 (1770). WEB. Fl. gött. 75 (1778).

Fuscina glauca SCHRANK Bayers. Fl. ii, 457 (1789).

Mnium glaucum WITH. Bot. arr. Br. Veg. 3 ed. iii, 801 (1796).

Dicranum glaucum HEDW. Fund. musc. ii, 92 (1782); Sp. musc. 135 (1801). ROTH Tent. Fl. germ. i, 461 (1788), et iii, 161. SIBTH. Fl. oxon. 281 (1794). SWARTZ Disp. musc. suec. 35 (1798). BRID. Musc. rec. ii, P. I, 165 (1798); Sp. musc. I, 205 (1806); Mant. musc. 66 (1819); Bry. univ. i, 407 (1826). ROEHL. Moosg. Deutsch. 351 (1800); Deutsch. Fl. iii, 75 (1813). SMITH Fl. brit. iii, 1216 (1804); Eng. Bot. t. 2166. TURN. Musc. hib. 73 (1804). P. BEAUV. Prodr. 54 (1805). SCHULTZ Fl. starg. 299 (1806). WEB. MOHR Bot. Tasch. 66 (1807). VOIT Musc. herbip. 38 (1812). SCHWAEG. Suppl. I, P. I, 187, t. 48 (1811). MART. Fl. cr. Erl. 105 (1817). HOOK. TAYL. Musc. Br. 52, t. 21 (1818). GRAY Nat. arr. Br. Pl. i, 734 (1821). HOOK. Fl. Scot. P. 2, 131 (1821); Brit. Fl. ii, 37 (1833). FUNCK Moost. 30, t. 21 (1821). ZENK. DIETR. Musc. Thuring. n. 40 (1822). HUEBEN. Musc. germ. 234 (1833). BALS. DE NOT. Prod. Bry. Mediol. 133 (1834). MACKAY Fl. hib. P. 2, 22 (1836). DE NOT. Syll. musc. n. 276 (1838).

Leucobryum vulgare HAMPE in Reg. bot. zeit. 1837, p. 282, et in Linnæa 1839, p. 42. C. MUELL. in Linn. 1843, p. 687; Syn. musc. i, 74 (1849). RABENH. Deutsch. Kr. Fl. ii, P. 3, 120 (1846).

Oncophorus glaucus BR. SCHIMP. Bry. eur. fasc. 41, mon. t. 1-2 (1849).

Leucobryum glaucum SCHIMP. Coroll. Br. eur. 19 (1855). Synops. 101, et 2 ed. 109. WILS. Bry. Brit. 82, t. 16 (1855). JENS. Bry. Dan. t. II, f. 10 (1856). BERK. Handb. Br. m. 276, t. 23, f. 6 (1863). MILDE Bry. Siles. 79 (1869). DE NOT. Epil. Briol. ital. 285 (1869). HOBK. Syn. Br. m. 49 (1873). HUSN. Mouss. nord-ouest 60 (1873).

Dioicous; in very dense cushioned tufts, pale glaucous green above, pale dirty brown below. Stems 1-6 in. high, dichotomous, fastigiate, not radiculose. Leaves in 13 rows, soft, patent, rarely subsecund, entire, from an oval-oblong base, lanceolate, tubulose from the incurved margins; lower half with a very narrow lamina of slender prosenchymatous cells. Perichætial bracts sheathing, lanceolate-subulate; seta elongated, rufous, twisted to the right when dry. Calyptra

subinflated, rostrate. Capsule exannulate, gibbous-ovate or oblong, glossy castaneous, when old blackish, cernuous, strumose, 8-striate, furrowed when dry; peristome deep purple, of 16 lanceolate teeth, cleft below the middle into two unequal legs; lid conic, rostrate, longer than capsule; spores ferruginous, smooth.

Male plants in distinct tufts, more slender, with terminal stellate inflorescence; perigonial bracts 6, ovate, concave, antheridia 10-12, oblong.

HAB.—Wet heaths and woods, common. Fr. rare, 10—3.

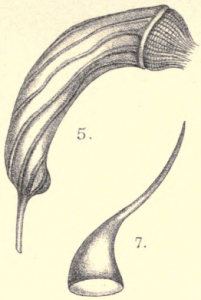
In fruit, Bantry (*Miss Hutchins*, 1812)! Near Rufus stone, New Forest (*Lyell*, 1813)! Cornwall (*Tozer*)! Woods about Beaconsfield and Dropmore (*Herb. Hook.*)! Foot of Knockindack, Kircudbright (*J. Cru*, 1840)! Criffel, Do. (*Gardiner*, 1840). Clova (*R. Brown*). Bramshill Park, Hants. (*R. S. Hill*, 1861). Near Exeter (*Parfitt*, 1855). Ardingly (*Woods*). Chailey Common, Sussex (*Mitten*). Ulpha moss, Levens (*Barnes*, 1866)!! Birch wood near Burnham Beeches (*Latimer Clark, Howse*)!! Near Great Marlow (*T. Walker*). Dartmoor (*Dr. de Crespigny*, 1870). Bog below Lambert's Castle, Lyme Regis (*A. Lister*, 1876). Morden Park, Holwell, Dorset (*Revs. H. Wood* and *O. P. Cambridge*, 1879)!!

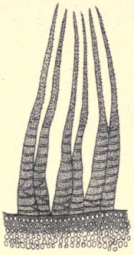
The male plant is very scarce, and the proliferous points of the branches may be easily mistaken for male inflorescence; the fruit appears to be produced through a large part of the year.

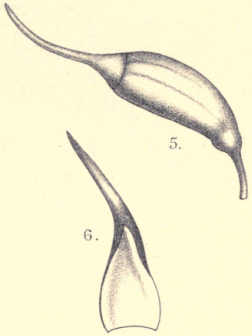
TAB. XIII.

Leucobryum glaucum.

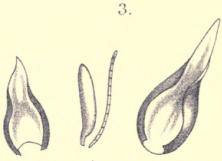
a. b. Female and male plant (Ulpha moss, *Barnes*). 1. Leaf. 1 a. Apex of same. 1 ab. Areolation of base. 1 x. Transverse section, showing foramina and chlorophyllose ducts. 1 xv. Vertical section. 2. Perichætial bract. 3. Male infl. 4. Antheridia, paraphyses and bract. 5. Capsules. 6. Calyptra. 7. Operculum. 8. Teeth of peristome. p. Young plants and radicular protonema at apex of sterile stem. p*. Single plant from same.



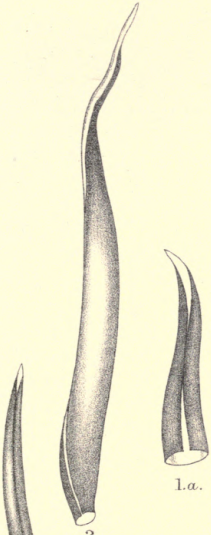


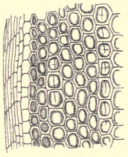






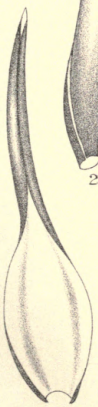


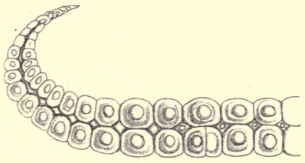


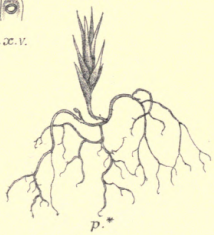












Leuc. glaucum.

R. Braithwaite, del. ad. nat. J. Nugent. Fitch. lith. Mintern. Bros. imp.

DICRANACEÆ.

or columella; spores developed in the single sporogonial cell, few, very large, smooth. Calyptra saccate, very thin, tearing irregularly and adhering in fragments to the capsule.—Der. ἀρχιδιον the beginning.

ARCHIDIUM ALTERNIFOLIUM (*Dicks.*) *Schimp.*

Paroicous; leaves distant, ovato-lanceolato-acuminate; perichætial bracts larger, crowded, from a broadly ovate base, lanceolate-subulate, with the nerve excurrent, the margin obsoletely toothed. (T. XIV, A.)

SYN.—*Phascum alternifolium* DICKS. Cr. fasc. I, 2, T. 1, fig. 2 (1785). RELH. Fl. cant. Suppl. alt. 18 (1788). WITH. Bot. arr. B. Veg. 3 ed. 786 (1796). ABBOT Fl. Bedf. 229 (1798). HULL Br. Fl. P. 2, 252 (1799). HEDW. Sp. musc. 24 (1801). SM. Fl. Brit. iii, 1157 (1804); Eng. Bot. t. 2107. SCHWAEGR. Suppl. 1, P. I, 10, T. 10 (1811). HOOK. TAYL. Musc. Br. 6, t. 5 (1818). GRAY Nat. arr. Br. pl. i, 711 (1821).

Phasc. globiferum BRUCH in Reg. bot. zeit. 1825, I, p. 281, t. 1.

Pleuridium alternif. BRID. p.p. Mant. musc. 10 (1819), et Bry. univ. ii, 161 (1827).

Phasc. Bruchii SPRENG. in L. syst. veg. iv, 142 (1827). HUEBEN. Musc. germ. 5 (1833).

Archid. phascoides BRID. Br. univ. i, 747, t. Suppl. 3 (1826). SCHWAEGR. Suppl. III, P. I, t. 205 (1827). BR. SCHIMP. Bry. eur. fasc. 1 (1837). DE NOT. Syll. n. 391 (1838). HARTM. Skand. Fl. C. MUELL. Syn. musc. i, 13 (1849). WILS. Bry. Brit. 24, t. 5 (1855). HUSN. Mouss. nord-ouest 37 (1873).

Archid. alternifolium SCHIMP. Syn. 28 (1860), et 2 ed. 23 et 810 (1876). BERK. Handb. Br. m. 305, t. 24, f. 10 (1863). MILDE Bry. Siles. 131 (1869). DE NOT. Epil. Bri. ital. 728 (1869). HOBK. Syn. Br. m. 26 (1873).

Paroicous or autoicous; in flat lax dull green patches. Plants very small, at first simple, later becoming branched, prostrate with erect innovations, and many slender small-leaved flagella. Stem leaves remote, minute, narrowly lanceolate, perich. bracts forming a coma, crowded, much longer, from an oval concave base, lanceolate-subulate, denticulate at apex; nerve narrow, vanishing in the apex; areolation rectangular at base, rhomboid above. Capsule terminal, or lateral by innovation, concealed in the perichætium, soft, pale yellow, globose, breaking up at maturity. Spores very large, about 16, smooth yellowish. Antheridia in the axils of the perich. bracts, or at base of perichætium, enclosed in two or more small ovate nerveless bracts.

HAB.—Wet fields and heaths, not rare. Fr. 3—5.

Gamlingay bogs (*Relhan*). Stevington bogs (*Abbot*). Belfast (*Drummond*)! Henfield (*Borrer*)! Hareley wood (*Nowell* 1856)!! Mere and Ashley, Cheshire (*Hunt*)!! Brighton and Tilgate forest (*Davies*)!! Todmorden (*Nowell*)!! Glenprosen (*Fergusson*). Dunnottar, Banchory (*Sim* 1870)! Coleshill, Warwick. (*Bagnall*).

This curious little moss varies in size, and also in the density, length and width of the leaves and extent of the nerve, which is sometimes excurrent. Although the capsule differs in structure from all other mosses by the absence of a spore sac and columella, its affinity is so close to *Pleuridium* in habit and foliage, that it seems to be better placed near that genus, than to regard it with Schimper as the type of a distinct family and order of

anomalous mosses. Without the fruit it bears much resemblance to *Pleuridium alternifolium* with which it was confounded by the early botanists. Our species is the only one found in Europe, but several closely allied forms occur in N. America.

2. PLEURIDIUM BRID.

(Mant. musc. 10 (1819).)

Plants very small, often producing flagella. Leaves lanceolate and lanceolate-subulate, nerved, glossy. Capsulè cleistocarpous, on a short pedicel, ovato-globose, with a short point, smooth, glossy. Calyptra small, cucullate. Spores rather large, granular.—Deriv. πλευριδιον at the side.

CLAVIS TO THE SPECIES.

Perich. bracts like the leaves; nerve narrow; cells large, lax.	*axillare.*
Perich. bracts much longer than the leaves; nerve broad; cells small.	
Paroicous, perich. bracts lanceolate-subulate.	*subulatum.*
Autoicous, perich. bracts oval, suddenly narrowed to a long setaceous point.	*alternifolium.*

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1. PLEURIDIUM AXILLARE (*Dicks.*) *Lindb.*

Paroicous; leaves and bracts narrowly lanceolate, acute, serrulate, pale and glossy, laxly areolate; nerve thin, vanishing below apex. Capsule oval. (T. XIV, B.)

SYN.—*Phascum axillare* DICKS. Cr. fasc. I, 2, T. 1, f. 3 (1785). SM. Eng. Bot. t. 1036 (1802); Fl. Brit. iii, 1149 (1804). TURN. Musc. hib. 1 (1804). WEB. MOHR Bot. Tasch. 63 (1807). ROEHL. Ann. Wett. ges. i, 193 (1809), et Deutsch. Fl. iii, 35 (1812). LA PYL. J. Bot. (1813). HOOK. TAYL. Musc. Brit. 7, t. 5 (1818). CASSEB. in Ann. Wett. ges. iv, 94 (1819). GRAY Nat. arr. Br. pl. i, 711 (1821). HOOK. Fl. Scot. P. 2, 122 (1821); Br. Flora ii, 3 (1833). NEES HORNSCH. Bry. germ. i, 61, t. 6, f. 15 (1823). HUEBEN. Bry. germ. 4 (1833). BALS. DE NOT. Prod. Bry. mediol. 175 (1834). MACKAY Fl. hib. P. 2, p. 8 (1836). DE NOT. Syll. musc. n. 401 (1838).

Phascum nitidum HEDW. Stirp. cr. i, 92, t. 34 (1787); Sp. musc. 19 (1801). TIMM Fl. meg. n. 717 (1788). SCHRANK Bayers. Fl. ii, 434 (1789). WITH. Bot. arr. Br. Veg. 3 ed. iii, 787 (1796). HOFFM. Deutsch. Fl. ii, 20 (1796). Brid. Musc. rec. ii, P. 1, 15 (1798); Sp. musc. I, 6 (1806); Mant. 7 (1819); Bry. univ. i, 35 (1826). HULL Br. Fl. P. 2, 252 (1799). SCHRAD. J. Bot. 1799, p. 55. ROTH Fl. germ. iii, P. 1, 113 (1800). ROEHL. Moosg. Deutsch. 24 (1800). P. BEAUV. Prodr. 82 (1805). SCHULTZ Fl. Starg. 272 (1806). SCHKUHR Deutsch. Kr. gew. P. II, 4, t. 1, f. 1 (1810). SCHWAEGR. Suppl. I, p. 1, 7 (1811). MART. Fl. cr. Erl. 126 (1817). BR. SCHIMP. Bry. eur. fasc. 1, p. 12, t. 6 (1837). WILS. Bry. brit. 34, t. 5 (1855). HUSN. Mouss. nord-ouest 35 (1873). HOBK. Syn. Br. m. 30 (1873).

Phasc. curvicollum (non EHRH.) SWARTZ Sum. Veg. Scand. 38 (1814). HARTM. Skand. Fl. 1—8 edd. (1820-61).

Astomum nitidum HAMPE in Linnæa (1832). C. MUELL. Synops. i, 17 (1849).

Ephemerum nitidum HAMPE in Reg. bot. Zeit. 1837, P. I, 285.

Astomum axillare HAMPE in Linnæa xii, 553 (1838).

Phasc. stagninum WALLR. in Linnæa xiv, 680 (1840).

Pleuridium nitidum RABENH. Deuts. Kr. Fl. ii, P. 3, 79 (1848). BR. SCH. Br. eur. fasc. 43 Suppl. t. 1 (1850); Synops. 23 (1860), et 2 ed. 24 (1876). BERK. Handb. Br. m. 298 (1863). MILDE Bry. siles. 132 (1869). DE NOT. Epil. Bri. ital. 731 (1869).

Pleuridium axillare LINDB. in Öfver. Vet. Akad. förh. xx, 407 (1863), et xxi, 584. FALK Beskrifn. öfver Skand. musc. cleist. 20.

Paroicous; plants very small, slender, simple or branched, pale glossy green. Leaves and perich. bracts alike, erecto-patent, lanceolate or lineal-lanc. acute, serrulate at apex, channelled, carinate; cells large, lax, pellucid, linear-rectangular; nerve slender, vanishing at $\frac{2}{3}$ length of leaf. Capsule on a short pedicel, small, elliptic-ovate, shortly rostellate, pale brown, often pseudo-lateral with the seta arcuate. Calyptra covering only top of capsule. Spores ferruginous.

HAB.—Wet clay fields and banks and by dried up pools, not uncommon. Fr. 10—2.

Var. *β.* **strictum** (*Dicks.*)

Plants smaller, very short, lurid green; leaves and bracts closer, narrower, straight; capsule nearly spherical.

SYN.—*Phascum strictum* DICKS. Cr. fasc. IV, 1, t. 10, f. 1 (1801). SM. Fl. Brit. iii, 1151; Eng. Bot. t. 2093. BRID. Sp. musc. I, 5; Mant. 7; Bry. univ. i, 34. SCHWAEGR. Suppl. I, P. I, 11. LA PYL. in Journ. Bot. 1813, p. 281.

Pleurid. nitidum β. minimum RABENH. Deutsch. Kr. Fl. ii, P. 3, 79.

Phasc. nitidum Var *β. strictum* WILS. Bry. Br. 35.

HAB.—Scotland (*Dickson.*)

Repeated innovation takes place on the same stem and thus several capsules appear above each other, and being thrust aside by the new growth acquire a lateral or axillar appearance.

2. PLEURIDIUM SUBULATUM (*Huds.*) *Rabenh.*

Paroicous; stems short, simple. Perichætial bracts lanceolate-subulate, minutely serrulate, nerve broad, continuous. Capsule roundish-ovate. (T. XIV, C.)

SYN.—*Muscus trichoides minor acaulos, capillaceis foliis*, DOODY. RAY Synops. 2 ed. app. 324 (1696); Hist. Pl. iii, 39 (1704).

Sphagnum acaulon trichoides DILL. Cat. Giss. 229 (1719); in RAY Synops. 3 ed. 105 (1724); Hist. musc. 251, T. 32, f. 10 (1741), et Herb.

Phascum subulatum HUDS. Fl. angl. 397 (1762). L. Sp. pl. 2 ed. ii, 1570 (1763). OEDER Fl. Dan. t. 249 (1766). WITH. Bot. arr. Br. veg. ii, 660 (1776). CURT. Fl. Lond. t. 67 (1778). RELH. Fl. Cant. Suppl. 16 (1786). SIBTH. Fl. Oxon. 272 (1794). ABBOT Fl. bedf. 229 (1798). HULL Br. Fl. P. 2, 251 (1799). SM. Fl. Brit. iii, 1149 (1804); Eng. Bot. t. 2177. TURN. Musc. hib. 1 (1804). WEB. MOHR Bot. Tasch. 64 (1807). SCHWAEGR. Suppl. I, P. I, 2 (1811). HOOK. TAYL. Musc. Brit. p.p. 6, t. 5 (1818) GRAY Nat. arr. Br. pl. i, 711 (1821). HOOK. Fl. Scot. P. 2, 121 (1821); Br. Fl. ii, 3 (1833). Hartm. Skand. Fl. NEES HORNSCH. Bry. germ. i, 63, p.p. t. 6, f. 16 (1823). BRUCH in Reg. bot. Zeit. 1825, P. I, 279, excl. syn. T. 1. HUEBEN. Musc. germ. 6, excl. syn. (1833). BR. SCHIMP. in Mem. soc. mus. Strasb. ii, 3, t. A. excl. syn. (1835); Bry. eur. i, Mon. 15, t. 7 (1837). MACKAY Fl. hib. P. 2, 7 (1836). DE NOT. Syll. musc. n. 403 (1838). FIOR. MAZ. Bry. rom. 2 ed. 1 (1841). WILS. Bry. Brit. 35, T. 5 d, excl. syn. (1855). HUSN. Mouss. nord-ouest 36 (1873). HOBK. Syn. Br. m. 30 (1873).

Astomum subulatum HAMPE in Reg. bot. zeit. 1837, P. 1, p. 285. C. MUELL. Synops. i, 14 excl. syn. (1849).

Pleuridium subulatum RABENH. Deutsch. Kr. Fl. ii, P. 3, 79 excl. syn. (1848). BR. SCH. Bry. eur. fasc. 43 Suppl. t. 1 excl. syn. (1850); Synops. 24 (1860), et 2 ed. 25 (1876). BERK. Handb. Br. m. 298 (1863). MILDE Bry. siles. 132 (1869). DE NOT. Epil. Briol. ital. 731 (1869).

Pleuridium acuminatum LINDB. in Öfv. vet. ak. förh. 1863, p. 406, et 1864, p. 585. FALK Beskrif. öfver Skand. musc. cleist. 21.

Phascum acuminatum LINDB. in HARTM. Sk. Fl. 9 ed. ii, 78 (1864).

Paroicous; pale green; stems simple, cæspitant. Leaves small, ovato-lanceolate; perich. bracts sometimes subsecund, lanceolate at base, gradually subulate, rather glossy, channelled, minutely serrulate; nerve broad and flat, continuous, scabrous at back of apex; cells at base rectangular, empty, upper much narrower, linear. Capsule brownish yellow, spherical or oval, rather truncate at base, with a short straight apiculus. Calyptra covering $\frac{1}{3}$ of capsule. Spores ferruginous. Antheridia naked in the axils of the perich. bracts.

HAB.—Sandy banks, heaths and sides of paths. Common. Fr. 3—4.

3. PLEURIDIUM ALTERNIFOLIUM (*Kaulf.*) *Rabenh.*

Autoicous; simple or with longish flagella. Perich. bracts from an oval base, abruptly narrowed into a very long subula, nerve broad and thick. Capsule oval, apiculate. (T. XIV, D.)

SYN.—*Phascum subulatum* SCHREB. de Phasco obs. 8 (1770); Spic. Fl. Lips. 71 (1771). HEDW. Stirp. cr. i, 93 t. 35 (1787); Sp. musc. 19. ROEHL. Moosg. Deutsch. i, 26 (1800). ROTH Fl. germ. iii, P. 1, 109 (1800). HOPPE in STURM Deutsch. Fl. ii, heft 6 (1803). SCHKUHR Deutsch. Kr. Gew. P. II, 4, t. 1 (1810). BRIDEL p.p. LINDB. in HARTM. Sk. Fl. 9 ed. ii, 78 (1864).

Phascum alternifolium KAULF. in STURM op. cit. heft 15 (1815). BRUCH in Reg. bot. zeit. 1825, P. 1, 273, t. 1. HUEBEN. Bry. germ. 4 (1833). BR. SCH. in Mem. soc. mus. Strasb. ii, 1, t. A (1835); Bry. eur. i, 15, t. 7 (1837). DE NOT. Syll. musc. n. 402 (1838). WILS. Bry. Brit. 35, t. 37 (1855). HUSN. Mouss. nord-ouest 36 (1873). HOBK. Syn. Br. m. 30 (1873).

Astomum alternifolium HAMPE in Reg. bot. zeit. 1837, p. 285. C. MUELL. Synops. i, 14 (1849).

Pleuridium alternif. RABENH. Deutsch. Kr. Fl. ii, P. 3, 79 (1848). BR. SCH. Br. eur. fasc. 43, Suppl. t. 2 (1850). SCHIMP. Synops. 24 (1860), et 2 ed. 26 (1876). BERK. Handb. Br. m. 299 (1863). MILDE Bry. siles. 133 (1869). DE NOT. Epil. Briol. ital. 730 (1869). BRID. Mant. musc. et Bry. univ. p.p.

Pleuridium subulatum LINDB. in Öfvers. Vet. ak. förh. 1863, p. 408, et 1864, p. 586. FALK Beskrif. öfver Skand. musc. cl. 22.

Autoicous; pale yellowish or dull green, $\frac{1}{3}$—1 in. high. Stems simple, or with longish small-leaved flagella on the older plants. Leaves ovato-lanceolate, with the nerve vanishing; perich. bracts from an oval or elliptic base, scarcely glossy, abruptly attenuated into a very long subula, channelled, densely serrulate on the margin and back, and mostly formed of the broad thick nerve which is faint at base; basal cells rectangular, chlorophyllose, upper much smaller, subquadrate. Capsule immersed, pale brown, spheric-oval, rather longly and obliquely apiculate, with a distinct neck. Calyptra broad, covering half capsule.

Male infl. gemmiform, axillar; the bracts ovate, acuminate, nerve obsolete.

HAB.—Fallow fields and wet heaths. Not uncommon. Fr. 5—6.

N. Wales (*Bowman*). Kinnaird (*Gardiner* 1844)!! Welburn (*Spruce*). Near Shotover (*Boswell*)! Hale, Ashley and Helsby (*Hunt*)!! Newtimber and Pylcomb Downs (*Davies* 1862)!! Haversham head, Westmoreland (*Barnes* 1871)! Mere, Cheshire (*Wilson* 1844)!!

Great confusion exists in the early authors between this species and the last, and *Archidium alternif.* and after the latter is separated, we still find the majority of references to *Pl. subulatum* belong to the present plant, due no doubt to the fact that it is by far the commonest species on the continent, while *Pl. subulatum* is much more frequent with us. Hedwig's beautiful figure well shows the male infl. and the position of this, with the long perich. bracts suddenly dilated at base, enable us readily to indentify *Pl. alternifolium.*

3. DITRICHUM TIMM.

(Fl. Megapolit. 216 (1788).)

Plants cæspitant, dwarf, or tall and slender, living on the ground or on rocks. Leaves lanceolate-subulate, smooth and glossy, the areolation narrowly rectangular above, lax and hexagono-rectangular at base. Calyptra narrow, cucullate. Capsule on a slender straight seta, usually erect, oval or subcylindric, annulate; peristome erect, of 16 longish teeth cleft to base into two filiform articulate papillose legs, fixed on a short membrane. Spores very small, smooth.—Deriv. δις two, ζρις hair.

Hampe in Regens. bot. zeit. 1867, p. 181, points out that this genus was founded by Timm on *D. pusillum*, and must supersede his own *Leptotrichum* not only by right of priority, but also because the latter was already in use for a genus of Fungi. About 25 species are known; but *L. vaginans* of Schimper's Synopsis, 2 ed. 140, and of Sullivant's Exsicc. is only a variety of *D. tortile*, and differs from *L. vaginans* Sull. Icones. (see LINDBERG Revis. crit. ic. Fl. Danica, p. 107.)

CLAVIS TO THE SPECIES.

Leaves squarrose. Capsule very narrow, cylindraceous.	*tenuifolium.*
Leaves erecto-patent or secund. Capsule ovate or elliptic.	
Paroicous. Leaves patent, setaceous.	*subulatum.*
Dioicous. Leaves subsecund or falcate.	
Stems short, straight; leaves lanceolate-subulate.	
Capsule cylindric, lid shortly rostellate.	*tortile.*
Capsule elliptic, lid conic, obtuse.	*homomallum.*
Stems tall, slender, flexuose; leaves flexuose, falcate.	*flexicaule.*

Sect. 1. *TRICHODON* (*Schimp.*). Plants dwarf, slender; leaves sheathing at base, suddenly subulate, flexuoso-squarrose. Capsule narrowly cylindraceous.

1. DITRICHUM TENUIFOLIUM (*Schrad.*) *Lindb.*

Dioicous; stem short; leaves flexuoso-squarrose, sheathing at base, subulate. Capsule on a slender pedicel, very narrowly cylindraceous, lid conical. (T. XIV, E.)

SYN.—*Trichostomum tenuifolium* SCHRAD. Journ. Bot. ii, P. 1, 58 (1799).

Trichostomum cylindricum HEDW. Sp. musc. 107, t. 24, f. 7-13 (1801). BRID. Sp. musc. I, 230 (1806), Mant. 83 (1819), Bry. univ. i, 491 (1826). SCHKUHR Deutsch. Kr. Gew. P. II, 79, t. 35 (1810). SCHWAEGR. Suppl. I, P. 1, 142 (1811). WAHLENB. Fl. lapp. 332 (1812). FUNCK Moost. 25, t. 16 (1821).

Dicranum cylindricum WEB. MOHR Bot. Tasch. 202 (1807). ROEHL. Deutsch. Fl. iii, 70 (1813).

Didymodon cylindr. WAHLENB. Fl. suec. ii, 754 (1826). SOMMERF. Suppl. Fl. lapp. 52 (1826). HARTMAN Skand. Fl. HOOK. Br. Fl. ii, 32 (1833).

Ceratodon cylindr. FÜRNR. in Reg. bot. zeit. 1829, P. 2, erg. 31. BR. SCH. Bry. eur. fasc. 29-30, t. 3 (1846). WILS. Bry. Brit. 85, t. 39 (1855). HARTM. Skand. Fl. 7 ed. Fl. Dan. Suppl. t. 114, f. 2. HOBK. Syn. Br. m. 49 (1873).

Angstroemia cylindr. C. MUELL. Synops. i, 441 (1849).

Trichodon cylindr. SCHIMP. Coroll. Br. eur. 36 (1856). Synops. 140 (1860), 2 ed. 138 (1876). BERK. Handb. Br. m. 275 (1863). MILDE Bry. Siles. 134. (1869). DE NOT. Epil. Briol. ital. 570 (1869).

Trichodon tenuifolius LINDB. Eur. Trich. 225 (1864).

Ditrichum tenuifolium LINDB. Musci Scand 27 (1879).

Dioicous; gregarious or in small yellowish green tufts; stem short, slender, simple or but little divided. Leaves patent, flexuose, squarrose, crisped when dry; the lower small, ovato-subulate, upper lanceolate-subulate, perich. bracts from a broad sheathing base, suddenly capillaceo-subulate, the nerve broad, forming the whole upper part of subula, and denticulate in the upper half; cells firm, narrow, elongated. Capsule on a long very slender pale reddish seta, leptodermous, very narrowly cylindraceous, slightly incurved in the middle, brown, erect or inclined; lid conic, rather obtuse, red; annulus broad, revoluble; teeth of per. pale red, the legs long, filiform, rough.

Male plant more slender, in distinct tufts; perig. bracts convolute concave, subulate, antheridia numerous with slender paraphyses.

HAB.—Fallow fields and wet sandy ground; rare. Fr. 5—6.

Castle Howard woods and Stockton forest, York (*Spruce*)!! Bowdon, Cheshire (*Hunt* 1868)!! Glen Prosen (*Fergusson* 1867)!! Ardingly and Tilgate, Sussex (*Mitten*). Belfast (*Drummond* 1830). Lancashire and Derbyshire (*Wilson*). Fruit very rare.

This species has been tossed about under various genera, but is clearly at home in the present one; it must be carefully discriminated from *Dicranella crispa* and *Grevillei* which have similar leaves.

Sect. 2. *EUDITRICHUM Lindb.* Plants slender, short or elongated. Leaves divergent, subsecund or falcate, lanceolate-subulate. Capsule oval or subcylindric.

2. DITRICHUM TORTILE (*Schrad.*) *Hampe.*

Dioicous; laxly cæspitose; leaves patent or subsecund, lanceolate-subulate, serrate at point, recurved at margin. Capsule erect, subcylindric, lid shortly rostellate. (T. XIV, F.)

SYN.—*Trichostomum tortile* SCHRAD. Samml. Kr. Gew, n. 49 (1797). USTERI Neue Bot. Ann. Fasc. xx. 108 (1799). BRID. Sp. musc. I, 231 (1806); Mant. 82 (1819); Bry. univ. i, 488 (1826). SCHWAEGR. Suppl. I, P. I, 139, t. 35 (1811). SCHULTZ Suppl. Fl. Starg. 70 (1819). FUNCK Moostasch. 25, t. 16 (1821). HUEBEN. Musc. Germ. 300 (1833). BR. SCH. Bry. eur. fasc. 18-20, p. 14, t. 10 (1846). RABENH. Deutsch. Kr. Fl. ii, P. 3, 116 (1848). WILS. Bry. brit. 115, t. 41 (1855). HUSN. Mouss. nord-ouest 71 (1873). HOBK. Syn. Br. m. 62 (1873).

Dicranum tortile BRID. Musc. rec. ii, P. I, 129 (1798). WEB. MOHR Bot. Tasch. 198, t. 7, fig. 12-13 (1807). VOIT Musc. herbip. 47 (1812). ROEHL. Deutsch. Fl. iii, 70 (1813).

Mnium tortile GMEL. Syst. nat. ii, 1328 (1791).

Didymodon tortilis W.-ARN. Disp. meth. 37 (1825). DE NOT. Syllab. musc. n. 367 (1838).

Leptotrichum tortile HAMPE Linnæa 1847, p. 74. C. MUELL. Syn. i, 454 (1849). SCHIMP. Syn. 143 (1860) et 2 ed. 139 (1876). BERK. Handb. Br. m. 262 (1863). MILDE Bry. Siles. 136 (1869). DE NOT. Epil. Briol. ital. 516 (1869).

Dioicous; dwarf, laxly cæspitose, pale glossy green; stem simple or little divided. Leaves subsecund or patent, curved, lanceolate-subulate, margin thickened, reflexed to the middle, serrate at apex, nerve subexcurrent; perich. bracts similar, but longer and sheathing; cells at base linear, elongated, above small and rounded. Seta subflexuose, slender, rufous, twisting to the left. Capsule erect, narrowly cylindraceous, regular or slightly curved, leptodermous, pale brown; annulus broad, revoluble; lid $\frac{1}{3}$ length of caps. red, conic, shortly rostellate; teeth of peristome on a broadish basal membrane, erect, slightly incurved when dry, red, the legs free or united here and there, papillose.

Male plants short, slender, infl. terminal; bracts 6—9, ovate, concave, subulate, nerved.

HAB.—Sandy banks, and old stone quarries; rare. Fr. 10—12.

Castle Howard (*Spruce* 1844)!! Rusthall common, Tunbridge Wells (*Borrer* 1846)! Hurstpierpoint (*Mitten* 1846)! Sea shore near Whitby (*Ibbotson*)!!

Var. β. pusillum (*Hedw.*)

Stems shorter, more densely crowded. Leaves shorter, nearly straight. Capsule oval or oblong, peristome shorter.

SYN.—*Trichostomum pusillum* HEDW. Musc. frond. i, 74 t. 28, f. 2, 4, 9, 10 (1787). ROTH. Fl. germ. i, 469. SM. Fl. Brit. iii, 1237. Eng. Bot. t. 2380. HARTM. Sk. Fl. 5 ed. 385. HUEBEN. Musc. germ. 298. Fl. Dan. Suppl. t. 45, f. 2.

Ditrichum pusillum TIMM Fl. megap. n. 777 (1788).

Bryum pusillum GMEL. Syst. nat. ii, 1333 (1791).

Bryum didymodon HOFFM. Deutsch. Fl. ii, 43 (1796).

Didymodon pusillus BRID. Musc. rec. ii, P. I, 115, t. 2, f. 4 (1798), Sp. musc. I, 159; Mant. 101; Bry. univ. i, 509. SWARTZ Musc. suec. 29. HEDW. Sp. musc. 104. ROEHL. Moosg. D. 242; Deutsch. Fl. iii, 56. P. BEAUV. Prodr. 56. WEB. MOHR Bot. Tasch. 157. SCHULTZ Fl. Starg. 288. SCHKUHR Deutsch. Kr. Gew. P. 2, 67, t. 30. SCHWAEGR. Suppl. I, P. I, 176. WAHLENB. Fl. lapp. 316; Fl. carp. 337. HOOK. Br. Fl. ii, 31. MACK. Fl. hib. P. 2, 19.

Barbula curta HEDW. Musc. fr. iii, 75, t. 31 B (1792); Sp. musc. 115. BRID. Musc. rec. ii, P. I, 192. SCHWAEGR. Suppl. I, P. I, 119. SCHULTZ Rev. gen. Barb. 5, t. 32, f. 2.

Tortula curta SWARTZ Musc. Suec. 41. HOOK. GREV. in Edin. J. Sci. i, 202.

Desmatodon curtus BRID. Mant. musc. 87; Bry. univ. i, 526.

Trichostomum tortile Var *β. pusillum* Bry. eur. t. 10 *β*.

HAB.—In similar localities and sometimes intermixed with the type.

Near Belfast (*Drummond*). Dodge's glen, Cork (*Carrol*). Castle Howard (*A. O. Black* 1854)!!

Smaller than the next species with much shorter leaves and the lid with a more pointed beak.

3. DITRICHUM HOMOMALLUM (*Hedw.*) *Hampe.*

Dioicous; cæspitose, dichotomous; leaves patent or subsecund, from an ovate base, subulate, nerve broad, excurrent in a setaceous point, entire. Capsule erect, ovate-oblong, lid conical, obtuse. (T. XIV, G.)

SYN.—*Weisia heteromalla* HEDW. Musc. fr. i, 22, t. 8 (1787); Sp. musc. 72 (1801). SWARTZ Musc. suec. 26 (1798). BRID. musc. rec. ii, P. I, 77 (1798); Sp. musc. I, 119 (1806); Mant. 47 (1819); Bry. univ. i, 361 (1826). ROEHL. Moosg. Deutsch. 161 (1800); Deutsch. Fl. iii, 51 (1813); Ann. Wett. Ges. iii, 109 (1814). SCHULTZ Fl. Starg. 284 (1806). SCHWAEGR. Suppl. I, P. I, 68 (1811). WAHLENB. Fl. lapp. 321 (1812).

Afzelia heteromalla EHRH. Pl. crypt. n. 173 (1787).

Bryum Weisia DICKS. Fasc. cryp. II, 5 (1790). WITH. Bot. arr. Br. veg. 827 (1796). HOFFM. Deutsch. Fl. ii, 33 (1796). HULL Br. Fl. P. 2, 261 (1799).

Grimmia heteromalla ROTH Fl. Germ. iii, 145 (1795). SM. Fl. Brit. iii, 1194 (1804), Eng. Bot. t. 1899. TURN. Musc. hib. 30 (1804). WEB. MOHR Bot. Tasch. 137 (1807).

Grimmia homomalla SM. loc. c.

Didymodon homomallus HEDW. Sp. musc. 105, t. 23, f. 1-2 (1801). P. BEAUV. Prodr. 56 (1805). BRID. Sp. musc. I, 161; Mant. 102; Bry. univ. i, 510. WEB. MOHR Bot. Tasch. 156. SCHKUHR Deutsch. Kr. Gew. P. 2, 64, t. 29 (1810). SCHWAEGR. Suppl. I, P. I, 116. VOIT Musc. herbip. 35 (1812). WAHLENB. Fl. lapp. 315. ROEHL. Deutsch. Fl. iii, 56; Ann. Wett. Ges. iii, 205. MART. Fl. cr. erl 96 (1817). FUNCK Moost. 21, t. 14 (1821).

Didymodon heteromallum HOOK. TAYL. Musc. Br. 68, t. 20 (1818). GRAY Nat. arr. Br. Pl. i, 743 (1821). MACK. Fl. hib. P. 2, 19 (1836).

Trichostomum homomallum BR. SCH. Bry. eur. fasc. 18-20, p. 16 t. 12 (1843). RABENH. Deutsch. Kr. Fl. ii, P. 3, 117 (1848). WILS. Bry. Brit. 116, t. 20 (1855). HUSN. Mouss. nord-ouest 72 (1873). HOBK. Syn. Br. m. 63 (1873).

Leptotrichum homomallum HAMPE Linn. 1847, p. 74. C. MUELL. Synops. i, 453 (1849). SCHIMP. Synops. 143 (1860), et 2 ed. 141 (1876). BERK. Handb. Br. m. 263 (1863). MILDE Bry. siles. 136 (1869). DE NOT. Epil. Bri. ital. 515 (1869). JENS. Bry. dan. 100. Fl. Dan. t. 2688, f. 1.

Dioicous; laxly cæspitose, pale green, subsericeous; stem simple or slightly divided. Leaves subsecund, from an ovate base, lanceolate-subulate; nerve dilated, concave, longly excurrent, quite entire or with a few minute crenulations at point; perich. bracts sheathing, longer, subfalcate; cells firm, very narrow. Seta tall, straight, purple. Capsule pachydermous, rufous, erect, ovate-oblong or subcylindric; annulus broad, compound, rolling back spirally; lid purple, conic, obtuse; teeth of per. purple, without basal membrane, the legs free or united.

Male plant slender, dichotomous, bracts lanceolate-subulate.

HAB.—Broken sandy ground and banks in subalpine districts; not uncommon. Fr. 9—11.

Dunkeld (*Borrer*). Rescobie and Loch Lomond (*Gardiner*)!! Inverness and Helvellyn (*Greville*)! Pont Aberglaslyn (Wilson)!! Repton rocks, Derby (*Purchas* 1862). Sale and Alderly edge (*Wilson*)!! Dunoon (*Hunt* 1865). Abernethy, Perth (*Howie*)! Todmorden and Hebden Valley (*Hunt* 1867)! Ashdown Forest (*Davies*)! Dartmoor (*Holmes*). Cheviots (*Hardy*). Ireland (*Moore*).

The peristome in this moss is very variable, and led the early bryologists to separate it into two species, their *Weissia heteromalla* having the legs of the teeth united; in other forms they are more or less joined by transverse bars.

Var. β. **zonatum** (*Funck*) *Lindb.*

Stems elongated, dichotomous, sparingly branched, in very dense tufts, ½—2 in. high, pale brown and rufescent below, deep green above. Leaves shorter, nearly straight, erecto-patent, appressed when dry; seta and capsule shorter.

SYN.—*Weissia zonata* FUNCK. BRID. Bry. univ. i, 364.

Leptotrichum nivale C. MUELL. Syn. ii, 611,

Leptotr. Molendianum LORENTZ MSS. DE NOT. Epil. Bri. ital. 517.

Leptotr. zonatum LORENTZ Verh. Zool. bot. Ges. Wien. 1867, p. 683, t. 22.

Leptotr. tenue Var. β. *glaciale* SCHIMP. Syn. 142.

Leptotr. vaginans Var. β. *glaciale* SCHIMP. Syn. 2 ed. 140.

HAB.—Mountain rocks.

Above Ffynon frech, Snowdon (*Wilson* 1828). Glen Callater (*Fergusson* 1868)!! Clough-na-ben (*Sim* 1869)! Ben Lawers (*West* 1880)!! Snowdon (*Nuttall* 1879)!

Differing greatly in aspect from the typical state, but the leaves agree exactly in structure, even to the apical crenulations. Always barren in Britain.

4. DITRICHUM SUBULATUM. (*Bruch*) *Hampe.*

Paroicous; slender, short, tufted; leaves patent or secund, ovate at base, suddenly subulate, entire. Capsule oval, erect; lid conic with a short beak. (T. XIV, H.)

SYN.—*Trichostomum subulatum* BRUCH in SALZM. Pl. Tingit. (1825). BR. SCH. Bry. eur. fasc. 18-20, p. 17, t. 13‖(1843). WILS. Bry. Brit. 117, t. 42 (1855).

Didymodon aureus DE NOT. Spicil. 12 (1837); Syll. musc. n. 266 (1838).

Leptotrichum subulatum HAMPE in Linnæa 1847. C. MUELL. Syn. i, 448 (1849). SCHIMP. Synops. 145 (1860), et 2 ed. 143 (1876). BERK. Handb. Br. m. 263 (1863). DE NOT. Epil. Briol. ital. 514 (1869).

Paroicous; slender, in lax, bright silky, yellow-green tufts; stem simple, naked at base. Leaves patent or secund, straight when dry, lower small, lanceolate, upper from an ovate base, subulate; nerve broad, excurrent; cells firm, elongate quadrate. Capsule on a purple seta, leptodermous, ovate, erect, golden brown; annulus indistinct; lid convex conic, shortly rostellate; teeth bifid, red, very slender, scabrous. Antheridia in pairs with paraphyses, in the axils of the upper leaves.

HAB.—On crumbling rocks of clay-slate; very rare. Fr. 3—4.

Trethowell near Truro (*Tozer*, refound by *Mr. Tellam* 1871)!! Saltash (*Brent* 1867)!!

A Mediterranean species which like several other plants of that region reaches the Cornish shore. Another fine species *L. pallidum* has not yet been added to our list.

5. DITRICHUM FLEXICAULE (*Schleich.*) *Hampe.*

Dioicous; tall, slender, densely tufted; stems branched, flexuose, radiculose; leaves secund, lanceolate at base, longly subulate, denticulate at margin. Capsule erect, ovate-oblong; lid conic, rostellate. (T. XV, A.)

SYN.—*Didymodon flexicaule* SCHLECH. Pl. cr. helv. Cent. 4, n. 9 (1807). ROEHL. Deutsch. Fl. iii, 56 (1813). BRID. Mant. musc. 100 (1819); Bry. univ. i, 506 (1826). HUEBEN. Musc. germ. 280 (1833). DE NOT. Syll. musc. n. 264 (1838), HARTM. Skand. Fl. 275.

Cynodontium flexicaule SCHWAEGR. Suppl. I, P. I, 115, t. 29 (1811). FUNCK Moost. 20, t. 14 (1821).

Trichostomum flexic. BR. SCH. Bry. eur. fasc. 18-20, p. 15, t. 11 (1843). WILS. Bry. Brit. 116, t. 42 (1855). HUSN. Mouss. nord-ouest 72 (1873). HOBK. Syn. Br. m. 62 (1873).

Leptotrichum flexic. HAMPE in Linn. 1847. C. MUELL. Synops. i, 449 (1849). JENS. Bry. dan. 101 (1856). SCHIMP. Syn. 144 (1860), et 2 ed. 142 (1876). BERK. Handb. Br. m. 262 (1863). MILDE Bry. siles. 137 (1869). DE NOT. Epil. Briol. ital. 514 (1869). Fl. Dan. t. 2688, f. 2.

Dioicous; 1—4 in. high, in dense soft yellow-green, glossy tufts, fuscescent below; stems slender, geniculate, flexuose, branched, very fragile, with abundance of fine radicles. Leaves rather lax, secund, subfalcate, lanceolate, longly subulate, flexuose when dry; nerve flattened, excurrent in the subula, denticulate at apex; cells short, elliptical; perich. bracts broader and sheathing. Capsule on a slender reddish seta, erect, rufous brown, ovate or elliptic, small, leptodermous, slightly unequal; annulus broad, compound; lid conic, elongated; teeth of per. red, filiform, unequal, fragile and fugacious.

Male plants slender in distinct tufts, rare; bracts ovate, subulate, the innermost nerveless.

HAB.—Limestone rocks and stony ground; not uncommon. Fr. 6.

Sometimes near the sea, as on Southport sands: sands at St. Minver, Cornwall (*Tellam* 1871); Portmarnock sands, Ireland. Fruit not found in Britain.

Var. *β.* **densum** *(Br. Sch.)*

Compactly tufted; stems straight, shorter and less branched. Leaves erect, shorter, straight.

SYN.—BR. SCH. Bry. Eur. SCHIMP. Synops. 145, et 2 ed. 143. WILS. Bry. Brit. 116.

HAB.—More mountainous districts.

Ben Lawers (*Dr. Stirton*). Chee-dale and Miller's-dale (*West*)!! Helsington Barrows, Westmoreland (*Barnes*)!! Malham moor (*Hobkirk* 1879)!!

This very pretty moss varies greatly in size, and except in the Jura mountains is everywhere rare in fruit.

4. SWARTZIA EHRHART.

(Pl. crypt. exsicc. n. 164 (1787).)

Plants in dense silky tufts; slender, fastigiate, dichotomous. Leaves distichous, spreading from a semiamplexicaul base, subulate, smooth; areolation hexagono-rectangular at base, narrow and quadrate above. Calyptra cucullate. Capsule erect or cernuous, glossy, ovate or cylindraceous; lid conic. Teeth 16, not confluent at base, lineal-lanceolate, irregularly separated at the divisural line, or variously torn or perforated. Spores smooth.—Inhabiting rocks or the ground. Deriv.—Named in honour of Olaf Swartz.

The close alliance between this genus and *Ditrichum flexicaule* will be seen at a glance, yet Schimper makes it the type of a distinct family, on account of the distichous leaves. The name *Swartzia* was adopted by Schreber in 1791 for a genus of Leguminous plants, but it will be seen that Ehrhart's name has four years priority, and therefore Schreber's genus must not only give way to Ehrhart's but stand under its older designation of *Tounatea* AUBLET (1775.)

CLAVIS TO THE SPECIES.

Capsule cylindric, erect.	*montana.*
Capsule ovate, cernuous.	*inclinata.*

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1. SWARTZIA MONTANA (*Lamk.*) *Lindb.*

Paroicous; leaves from an oblong base, longly subulate, patent. Capsule erect, oval-cylindric, teeth of per. short, irregularly cleft. (T. XV, B.)

SYN.—*Bryam montanum* LAMARCK Fl. franc. i, 48 (1778). ALLIONI Fl. pedem. ii, 299 (1785).

Mnium capillaceum SWARTZ in nov. act. Soc. ups, iv, 241 (1784), excl. syn. Dill.

Bryum capill. DICKS. Pl. cr. Brit. fasc. 1, 4, t. 1, f. 6 (1785). HOFFM. Deutsch. Fl. ii, 42 (1796). WITH. Bot. arr. Br. veg. 3 ed. iii, 831 (1796). HULL Br. Fl. P. 2, 262 (1799).

Swartzia capillacea EHRH. Pl. cr. exs. dec. 17, n. 164 (1787). HEDW. St. crypt. ii, 72, t. 26 (1789). BRID. Musc. rec. ii, P. I, 117 (1798). ROEHL. Moosg. Deutsch. 208 (1800). P. BEAUV. Prodr. 90 (1805).

Didymodon capill. SCHRAD. Spic. Fl. germ. 64 (1794). ROTH Fl. germ. iii, P. I, 199 (1795). SWARTZ Musc. suec. 28 (1798). WEB. MOHR Bot. Tasch. 155 (1807). SCHKUHR Deutsch. Cr. Gew. P. II, 65, t. 39 (1810). WAHLENB. Fl. lapp. 314 (1812). VOIT Musc. herb. 34 (1812). ROEHL. Deutsch. Fl. iii, 55 (1813), Ann. Wett. Ges. iii, 199. HOOK. TAYL. Musc. Br. 67, t. 20 (1818). BRID. Mant. 100 (1819); Bry. univ. i, 504 (1826). GRAY Nat. arr. Br. pl. i, 743 (1821). HOOK. Fl. Scot. P. 2, 136 (1821); Br. Fl. ii, 30 (1833). HUEB. Bry. ger. 281. MACK. Fl. hib. P. 2, 18 (1836). HUSN. Mouss. nord-ouest 69 (1873).

Cynontodium capill. HEDW. Sp. musc. 57 (1801).

Cynodontium capill. BRID. Sp. musc. I, 158 (1806). SCHULTZ Fl. Starg. 289 (1806). SCHWAEGR. Suppl. I, P. I, 114 (1811). MART. Fl. cr. erl. 95 (1817). FUNCK. Moost. 21, t. 14 (1821).

Trichostomum capill. SM. Fl. Brit. iii, 1236 (1804); Eng. Bot. t. 1152. TURN. Musc. hib. 35 (1804).

Distichium capill. BR. SCH. Bry. eur. fasc. 29-30, p. 4, t. 1 (1846). RABENH. Deutsch. Kr. Fl. ii, S. 3, 118 (1848). C. MUELL. Syn. i, 40 (1849). WILS. Bry. Brit. 104, t. 20 (1855). SCHIMP. Synops. 135 (1860), et 2 ed. 146 (1876). BERK. Handb. Br. m. 266 t. 22 f. 7 (1863). MILDE Bry. siles. 138 (1869). DE NOT. Epil. 660 (1869). HOBK. Syn. Br. m. 58 (1873).

Leptotrichum capill. MITT. Musc. Ind. or. 10 (1859).

Paroicous; tall, slender, dichotomous, 1—4 in. high; in dense silky green tufts, ferruginous below, interwoven with rufous tomentum. Leaves from a pale sheathing ovate base, flexuoso-patulous, lanceolate, longly subulate, with a flattened nerve, entire, or with a few teeth at apex; cells narrow and pellucid at base, oblique and thin walled at the margin where the narrow part begins, rounded-quadrate, chlorophyllose and subpapillose in the subula; perich. bracts two, longly sheathing. Capsule on a firm red seta, twisting to the right when dry, erect or occasionally subcernuous, leptodermous, ovate-oblong or cylindraceous, regular or slightly curved on one side, glossy, rufous; lid red, conic; annulus breaking up. Teeth of peristome narrow, pale red, cleft in the divisural line, or with the legs adhering or perforated. Antheridia naked in the axils of the upper leaves with long paraphyses.

HAB.—Wet crevices of rocks on all our mountains. Miller's dale, Derbyshire *(Mr. Holt)*!! Fr. 5—7.

Very variable in size according to the locality, sometimes only reaching an inch in height, at others as much as 5 in., the colour also in the older plants becomes of a straw tint. Schimper confidently cites the reference "*Mnium capillaceum* LINN. Fl. lapp," but the plant does not appear in that work, and in the 2nd ed. of it by Smith (1792), it is entered at p. 333 as "*Mnium foliis capillaceis, capsulis erectiusculis oblongis, operculo conico.*"

Var. *β.* **compacta** *(Hueben.)*

Plants short, densely tufted, the leaves short and crowded, suberect, capsule short, elliptical.

SYN.—*Didymodon subulatus* SCHKUHR Deutsch. Kr. Gew. P. II, 65, t. 28 (1810). WALLR. Fl. cr. germ. i, 182.

Didym. distichus Brid. Mant. musc. 101; Bry. univ. i, 507.

Didym. capillaceus Var. *β. compactus* HUEBEN. Bry. germ. 282.

Distichium capill. Var. *β. brevifolium* BR. SCH. Bry. eur. WILS. Bry. brit. 105. SCHIMP. Synops. DE NOT. Epil.

HAB.—Higher mountains in the North. Rocks above Loch-na-Gat, Ben Lawers (*Braithwaite* 1862.)

2. SWARTZIA INCLINATA *Ehrh.*

Autoicous; in small dull green tufts; leaves shorter, narrower, more serrate at point. Capsule ovate, cernuous; teeth of peristome broader, two-legged. (T. XV, C.)

SYN.—*Afzelia inclinata* EHRH. Pl. cr. exs. n. 193 (1787).

Swartzia inclinata EHRHART. HEDW. Stirp. crypt. ii, 74, t. 27 (1788). BRID. musc. rec. ii, P. I, 119 (1798). P. BEAUV. Prodr. 90 (1805).

Bryum inclin. DICKS. Pl. crypt. fasc. II, 9 (1790). LAICHARD. Pl. eur. 479 (1794). WITH. Bot. arr. Br. Veg. 3 ed. iii, 835 (1796). HULL Br. Fl. P. 2, 264 (1799).

Didymodon inclin. SWARTZ musc. suec. 28 (1798). WEB. MOHR Bot. Tasch. 153 (1807). SCHKUHR Deutsch. Kr. Gew. P. II, 64 t. 28 (1810). WAHLENB. Fl. lapp. 314 (1812). ROEHL. Deutsch. Fl. iii, 55 (1813); Ann. Wett. Gesell. iii, 198. HOOK. TAYL. Musc. Brit. 65, t. 20 (1818). HOOK. Fl. scot. P. 2, 135 (1821); Br. Fl. ii, 28 (1833). GRAY Nat. arr. Br. pl. i, 742 (1821). MACK. Fl. hibern. P. 2, 17 (1836). HARTM. Sk. Fl. 4 ed. 379 (1843).

Cynontodium inclin. HEDW. Sp. musc. 58 (1801).

Grimmia inclinata SM. Fl. Brit. iii, 1193 (1804); Eng. Bot. t. 1824.

Cynodontium inclin. BRID. Sp. musc. I, 155 (1806). SCHWAEGR. Suppl. I, P. I, 111 (1811). FUNCK Moost. 20, t. 14 (1821).

Cynodon inclin. BRID. Mant. musc. 99 (1819); Bry. univ. i, 501 (1826).

Ceratodon inclin. HUEBEN. Bry. germ. 273 (1833).

Distichium inclin. BR. SCH. Bry. eur. fasc. 29-30, p. 5, t. 2 (1846). RABENH. Deutsch. Kr. Fl. ii, S. 3, 118 (1848). C. MUELL. Syn. i, 41 (1849). WILS. Bry. Brit. 105, t. 20 (1855). SCHIMP. Syn. 136 (1860), et 2 ed. 147 (1876). BERK. Handb. Br. m. 267 (1863). MILDE Bry. siles. 139 (1869). DE NOT. Epil. 661 (1869). HOBK. Syn. Br. m. 58 (1873).

Leptotrichum inclin. MITT. Musc. Ind. or. 10 (1859).

Autoicous; in small irregular olivaceous-green tufts; stems ½—1 in. high, little branched. Leaves densely crowded, narrower, shorter, minutely serrate at point; cells longer; perich. bracts three, longer. Capsule pachydermous, cernuous, ovate, olive colored, when empty brown with a glossy red mouth; annulus broad; lid conic, attenuated. Teeth of per. broader, red, cleft into 2 or 3 legs or perforated, jointed.

Male infl. below the female, bracts 1—3, ovate, concave, subulate.

HAB.—Rocks or stony ground in alpine districts; rare. Fr. 6—7.

Sands of Barrie, Dundee (*Don*)!! Tent's moor, Fife (*Black* 1853)!! Aberdour, Fife (*Howie* 1861)! Ben Lawers and Clova (*Fergusson* 1868)! Connemara, Ben Bulben and Ballycastle, Ireland.

Subf. 2. *DICRANELLEÆ.* Plants small, scarcely branched; leaves smooth, lanceolate-subulate, cells parenchymatous, without basal angular ones of a different form. Peristome of 16 teeth, dicranoid, the legs filiform, rough.

5. DICRANELLA SCHIMP.

(Coroll. Bry. Eur. 13 (1855).)

Small mosses with short slightly branched stems; leaves from an oval base, abruptly subulate, channelled, with the margin plane and nerve broad, flattened and indistinct below. Capsule when empty plicato-striate, leptodermous, erect or suberect, regular or slightly oblique, the cells of the exothecium irregularly oblong and curved, with flexuose walls. Peristome smaller, thinner, paler and scarcely papillose. (*Lindberg.*)—Deriv. Diminutive of *Dicranum.*

After some hesitation I have adopted Mr. Mitten's genus *Anisothecium*, usually combined with *Dicranella*, not so much from the convenience it affords in dividing some 80 species, as from the belief that it is a natural one, though difficult to define in words; in both genera, the absence of inflated cells at the basal angles of the leaf will at once separate the species from *Dicranum*.

CLAVIS TO THE SPECIES.

Seta red.	
Leaves divaricate, flexuose.	*crispa.*
Leaves secund.	
Capsule cernuous, perich. bracts sheathing.	*secunda.*
Capsule suberect, perich. bracts not sheathing.	*curvata.*
Seta pale straw color.	
Capsule oblong, tapering at neck.	*heteromalla.*
Capsule gibbous, strumose at neck.	*cerviculata.*

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1. DICRANELLA CRISPA (*Ehrh.*) *Schimp.*

Autoicous or dioicous; small, slender, leaves from a semivaginant base, subulate, flexuoso-patent. Capsule erect, oval, striate; lid rostrate. (T. XV, D.)

SYN.—*Dicranum crispum* EHRH. MSS. HEDW. Stirp. cr. ii, 91, t. 33 (1788); Sp. musc. 133 (1801). SWARTZ Musc. suec. 37 (1798). BRID. Musc. rec. ii, P. I, 161 (1798), Sp. musc. I, 199 (1806), Mant. 64 (1819), Bry. univ. i, 451 (1826). ROEHL. Moosg. Deutsch. 334 (1800), Deutsch. Fl. iii, 70 (1813). SM. Eng. Bot. t. 1151 (1803), Fl. Brit. iii, 1207 (1804). TURN. Musc. hib. 65 (1804). P. BEAUV. Prodr. 53 (1805). WEB. MOHR Bot. Tasch. 185 (1807). SCHWAEGR. Suppl. I, P. I, 179 (1811). WAHLENB. Fl. lapp. 341 (1812). HOOK. TAYL. Musc. Br. 56, t. 17 (1818). GRAY Nat. arr. Br. pl. i, 737 (1821). HOOK. Fl. Scot. P. 2, 133 (1821); Br. Fl. ii, 41 (1833). HUEBEN. Musc. germ. 265 (1833). MACK. Fl. hib. P. 2, 23 (1836). RABENH. Deutsch. Kr. Fl. ii, S. 3, 139 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 20, t. 8 (1847). WILS. Bry. Brit. 70, t. 17 (1855). HUSN. Mouss. nord-ouest 48 (1873). HOBK. Syn. Br. m. 41 (1873).

Bryum vaginale DICKS. Pl. cr. Brit. fasc. III, 8 (1793). WITH. Bot. arr. Br. veg. 3 ed. iii, 827 (1796). HULL Br. Fl. P. 2, 261 (1799).

Ångstroemia crispa C. MUELL. Synops. 439 (1849).

Dicranella crispa SCHIMP. Coroll. 13 (1855), Synops. 69 (1860), et 2 ed. 70 (1876). BERK. Handb. Br. m. 280 (1863). MILDE Bry. siles. 57 (1869). DE NOT. Epil. Bri. ital. 641 (1869).

Autoicous or dioicous; small, slender, laxly cæspitose, glossy yellowish; leaves from a broad semivaginant base, abruptly subulate, flexuoso-patulous or subfalcate, crisped when dry, minutely toothed at apex; cells elongated. Capsule rufous, erect, obovate or oval, striate, sulcate when dry, on a purple seta; lid with a subulate beak, crenulate at base; annulus very narrow; teeth red, cleft to middle. Male on a proper branch or on a distinct plant; bracts resembling the leaves of stem.

HAB.—Wet sandy ground; not common. Fr. 8.

N. of Ireland (*Miss Hutchins* 1808)! Belfast (*Templeton*). Herringfleet (*Turner* 1809)! Birmingham (*Mackay*). Near Paisley (*D. Don*). Kenmore (*Hooker* 1829). Forfar (*Arnott* 1825). Gale green, Pilkington, Orford mount and Thelwall, Warrington (*Wilson* 1847)!! Broken brow, Prestwich and Alderley edge (*Hunt* 1863)!!

The adoption of the genus *Anisothecium* enables us to retain the specific name *crispum* for this plant, which otherwise would have to give way to Dickson's and be termed *D. vaginalis*, for *Dicranella Schreberi* was named *crispum* seventeen years before the present plant was known.

2. DICRANELLA SECUNDA (*Swartz.*) *Lindb.*

Dioicous; slender, leaves lanceolate at base, longly subulate, channelled, entire; perich. bracts longly subulate, convolute and sheathing. Seta red; capsule cernuous, ovate, gibbous; lid convexo-conic, longly subulate. (T. XV, E.)

SYN.—*Dicranum secundum* SWARTZ in Vet. Ak. Handl. 1795, p. 244.

Dicranum subulatum HEDW. Sp. musc. 128, t. 34, f. 1-5 (1801). SM. Fl. Brit. iii, 1206 (1804); Eng. Bot. t. 1273. TURN. Musc. Hib. 68 (1804). BRID. Sp. musc. I, 181 (1806), Mant. 59 (1819), Bry. univ. i, 426 (1826). SCHWAEGR. Suppl. I, P. I, 175 (1811). ROEHL. Deutsch. Fl. iii, 72 (1813). HOOK. TAYL. Musc. Br. 59, t. 18 (1818). FUNCK Moost. 28, t. 20 (1821). GRAY Nat. arr. Br. pl. i, 739 (1821). HUEBEN. Musc. germ. 258 (1833). MACK. Fl. hib. P. 2, 24 (1836). DE NOT. Syll. musc. n. 293 (1838), Epil. Bry. ital. 634 (1869). RABENH. Deutsch. Kr. Fl. ii, S. 3, 141 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 24, t. 13 (1847). WILS. Bry. brit. 70, t. 18 (1855). HARTM. Skand. Fl. HOBK. Syn. Br. m. 43.

Dicranum sudeticum SCHWAEGR. Suppl. I, P. I, 175, t. 45. BRID. Mant. 61; Bry. univ. i, 432. HUEBEN. op. cit. 260.

Angstroemia subulata C. MUELL. Synops. 433 (1849).

Dicranella subulata SCHIMP. Coroll. 13 (1855), Synops. 74 (1860), et 2 ed. 75 (1876). BERK. Handb. Br. m. 283 (1863). MILDE Bry. Siles. 60 (1869).

Dioicous; slender, closely crowded, silky yellowish-green, ½—1 in. high; leaves from a lanceolate subvaginant base, longly subulate, channelled, falcato-secund, entire; nerve thin excurrent; lower cells toward margin narrow and elongated, upper oblong; perich. bracts convolute sheathing, longly subulate. Capsule on a purplish seta, subcernuous, ovate, gibbous, glossy rufo-fuscous, obsoletely striate, sulcate when dry; annulus revoluble, of two rows of cells; lid convex-conic, longly subulato-rostrate; perist. pale red, teeth incurved. Male plant more slender, innovating; bracts ovato-subulate, very concave.

HAB.—Wet stony ground in mountainous districts. Fr. 9.

Ben Lawers, Mael Girdy and Ben More (*Wilson*)!! Aberfeldy (*Borrer*). Gale green and Pilkington (*Wilson* 1844)! Belfast (*Miss Hutchins*)! Gibson wood, Heptonstall (*Nowell* 1860)!! Dunoon (*Hunt* 1865)!! Craigailleach (*Braithwaite* 1865)!!

Resembling the much commoner *D. heteromalla*, but easily distinguished by the red seta and smaller firmer capsule.

3. DICRANELLA CURVATA (*Hedw.*) *Schimp.*

Dioicous; slender, resembling *D. secunda;* perich. bracts semivaginant, falcate. Capsule erect, oblong. (T. XV, F.)

SYN.—*Dicranum curvatum* HEDW. Sp. musc. 132, t. 31, f. 7-12 (1801). BRID. Sp. musc. I, 179 (1806), Mant. 58 (1819), Bry. univ. i, 425 (1826). SCHWAEGR. Suppl. I, P. I, 172 (1811). ROEHL. Deutsch. Fl. iii, 72 (1813). FUNCK Moost. 29, t. 19 (1821). BR. SCH. Bry. Eur. fasc. 37-40, p. 24 t. 14 (1847). HOBK. Syn. Br. m. 44 (1873).

Dicranum subulatum Var. *curvatum* HUEBEN. Bry. Germ. 259 (1833). RABENH. Deutsch. Kr. Fl. ii, S. 3, 141 (1848).

Ångstroemia curvata C. MUELL. Synops. i, 433 (1849).

Dicranella curvata SCHIMP. Coroll. 13 (1855), Synops. 75 (1860), et 2 ed. 76 (1876). MILDE Bry. siles. 60 (1869).

Dioicous; slender, laxly cæspitose, dull yellowish-green; leaves from a shorter semivaginant ovate base, setaceous, falcato-secund, channelled, minutely denticulate at apex; cells elongated, very narrow toward margin; perich. bracts thinner and with longer lamina. Capsule on a pale red seta, erect or a little inclined, ovate-oblong, equal, pale brown, annulate, striate; lid, peristome and male plant as in *D. secunda.*

HAB.—Wet sandstone rocks and sides of hollow ways; rare. Fr. 10—1.

Cwm Gafr near Llanberis (*Wilson* 1830)!! Dolgelly (*Wilson*). Hills of Dunoon, Greenock (*Drummond* Brit. Mosses 115).

Very close to the preceding and probably often confounded with it; in Europe it appears to be confined to the more southern portion of the central part.

4. DICRANELLA HETEROMALLA (*Dill. L.*) *Schimp.*

Dioicous; densely cæspitose, silky green; leaves arcuato-secund, lanceolate, suddenly setaceous. Seta yellowish. Capsule suberect, oblong, slightly curved; lid subulate. (T. XV, G.)

SYN.—*Muscus trichoides, foliis capillaceis, capitulis minoribus.* DOODY, RAY Syn. stirp. Brit. App. 243 (1690).

Bryum trichoides, reclinatis cauliculis, capitulis erectis acutis DILL. in Ray Syn. 3 ed. 96, n. 23 (1724).

Bryum heteromallum DILL. Hist. musc. 375, t. 47, f. 37 (1741). L. Sp. pl. ii, 1118 (1753); Fl. suec. 999. HUDS. Fl. angl. 408 (1762). OEDER Fl. dan. t. 479 (1769). NECK. Meth. musc. 209 (1771). WITH. Bot. arr. Br. veg. ii, 674 (1776). LIGHTF. Fl. scot. ii, 726 (1777). RELHAN Fl. cant. 404 (1785). HOFFM. Deutsch. Fl. ii, 38 (1796). HULL. Br. Fl. P. 2, 263 (1799). ABBOT Fl. Bedf. 240 (1798).

Hypnum heterom. WEISS Cr. Goett. 215 (1770). WEBER Spic. Fl. Goett 72 (1778).

Fusciua heterom. SCHRANK Bayers. Fl. ii, 454 (1789), Pr. Fl. Salisb. n. 829 (1792).

Dicranum heterom. Hedw. Stirp. cr. i, 68, t. 26 (1787), Sp. musc. 128 (1801). ROTH Fl. germ. i, 460 (1788), iii. 160. SIBTH. Fl. oxon. 282 (1794). SWARTZ Musc. Suec. 37 (1798). BRID. Musc. rec. ii. P. 1, 128, t. 3. f. 18 (1798), Sp. musc. I, 181 (1806), Mant. 69 (1819), Bry. univ. i, 423 (1826). ROEHL. Moosg. Deutsch. 319 (1800), Deutsch. Fl. iii, 72 (1813). SM. Fl. Brit. iii, 1204 (1804); Eng. Bot. t. 1272. TURN. Musc. hib. 61 (1804). P. BEAUV. Prodr. 54 (1805). SCHULTZ Fl. Starg. 296 (1806). WEB. MOHR Bot. Tasch. 190 (1807). SCHWAEGR. Suppl. I, P. I, 173 (1811). VOIT Musc. herbip. 42 (1812). MART. Fl. cr. erl. 98 (1817). HOOK. TAYL. Musc. Brit. 59, t. 18 (1818). FUNCK Moost. 28, t. 19 (1821). GRAY Nat. arr. Br. pl. i, 738 (1821). HOOK. Fl. scot. P. 2, 134 (1821); Br. Fl. ii, 42 (1833). HUEBEN. Musc. germ. 257 (1833). MACK. Fl. hib. P. 2, 24 (1836). DE NOT. Syll. musc. n. 292 (1838), Epil. Bri. ital. 634 (1869). RABENH. Deutsch. Kr. Fl. ii, S. 3, 141 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 25, t. 15 (1847). WILS. Bry. Brit. 73, t. 18 (1855). HUSN. Mouss. nord-ouest 51 (1873). HOBK. Syn. Br. m. 44 (1873).

Ångstroemia heterom. C. MUELL. i, 433 (1849).

Dicranella heterom. SCHIMP. Coroll. 13 (1855), Synops. 75 (1860), et 2 ed. 77 (1876). BERK. Handb. Br. m. 283, t. 23, f. 8 (1863). Milde. Bry. siles. 61 (1869).

Dioicous; in dense silky bright green or yellow-green patches. Stem erect ½—2 in. high, slender, with rufous radicles at base, simple or bipartite; leaves arcuato or hamato-secund, from a broad lanceolate base, suddenly setaceous, channelled, the point nearly entire or minutely

denticulated; cells at base about 14 rows, elongated rectangular, short and elliptic toward margin at the shoulder; perich. bracts with longer sheaths. Capsule on a slender pale yellow seta, erect, suberect or inclining, obovate or oblong, a little curved, glossy rufous-brown, obsoletely striate; when dry and empty, elongated, longitudinally plicate, with the mouth incurved; annulus very narrow, adherent; lid hemispherico-conoid at base, longly rostrate; teeth of peristome red, cleft to middle into two or sometimes 3 unequal legs.

Male plant shorter, in distinct tufts or mixed with the female, bracts ovate and concave at base, subulate.

HAB.—Damp banks, hollow roads and sandstone rocks; very common. Fr. 11—3.

Var. β. **stricta** *Schimp.*

Leaves straight, erecto-patent; seta elongated, flexuose.

SYN.—*Dicranum heterom.* Var β. strictum BR. SCHIMP. Bry. eur. l. c.
Ångstroemia heterom. β. stricta C. MUELL. Synops.
Didymodon chlorophyllosus WEB. MOHR.

HAB.—Gortagoree, Killarney (*Taylor* 1840)! Inverness, Carse of Ardersier, Inverness (*Croall* 1847)!

Var. γ. **interrupta** (*Hedw.*)

Stem taller, more branched; leaves uniform, or interrupted, patent or falcato-secund.

SYN.—*Dicranum interruptum* BRID. Musc. rec. ii, P. I, 159 (1798), Sp. musc. I, 179; Mant. 65, Br. univ. i, 438. HEDW. Sp. musc. 129, t. 19 f. 8-12. SM. Fl. Brit. iii, 1205. Eng. Bot. t. 2508. SCHWAEGR. op. c. 172.
Dicranum caducum BRID. Bry. univ. i, 425.
Dicranum heterom. β. interruptum HUEBEN. l. c. BR. SCH. Bry. eur. WILS. Bry. Brit. SCHIMP. Synops., &c.

HAB.—Scotland (*Winch* 1803). Ardingley, Sussex (*Davies*)! Marsden moor (*West* 1880)!!

Var. δ. **sericea** *Schimp.*

In small, bright, green, silky tufts. Leaves soft, longer and narrower, spreading or subsecund.

SYN.—*Dicranum trichodes* WILS. MSS.
Dicranodontium sericeum SCHIMP. BRY. EUR. Suppl. fasc. 1-2. HUSN. mouss. nord-ouest 56.
Dicranella heteromalla Var. δ *sericea* SCHIMP. Synops. 2 ed. 78.

HAB.—Sandstone rocks, almost always barren.

Rattand Clough and Green's Clough, Todmorden (*Nowell* 1858)! Alderley edge (*Hunt* 1863)!! Astley chapel and Rochdale (*Dr. Wood*)! Entwistle, Bolton (*Whitehead* 1865)!! Colintraive, Argyle (*Hunt* 1866)!

Wilson's specimens named *Dicr. trichodes* are closely intermixed with *Blindia acuta*, and the leaves of the latter had no doubt been submitted to the microscope, as they have enlarged angular cells as in *Dicranum*.

5. DICRANELLA CERVICULATA (*Hedw.*) *Schimp.*

Dioicous; widely cæspitose; leaves lanceolato-subulate, flexuose, patent, with a flattened nerve. Capsule on a yellow seta, cernuous, ovate, gibbous, slightly strumose at neck; lid subulate, rostrate. (T. XVI, A.)

SYN.—*Dicranum cerviculatum* HEDW. Stirp. cr. iii, 89, T. 37, A (1792), Sp. Musc. 149 (1801). SWARTZ Musc. suec. 36 (1798). BRID. Musc. rec. ii, P. I, 180 (1798), Sp. musc. I, 221 (1806), Mant. 53 (1819). ROEHL. Moosg. Deutsch. 379 (1800), Deutsch. Fl. iii, 74 (1813). SM. Fl. Brit. iii, 1220 (1804); Eng. Bot. 1661. TURN. Musc. hib. 64 (1804). P. BEAUV. Prodr. 53 (1805). SCHULTZ Fl. Starg. 302 (1806). WEB. MOHR Bot. Tasch. 193 (1807). SCHWAEGR. Suppl. I, P. I, 221 (1811). VOIT Musc. herbip. 48 (1812). HOOK. TAYL. Musc. Brit. 53, t. 16 (1818). MART. Fl. cr. Erl. 106 (1817). FUNCK Moost. 31, t. 22 (1821). GRAY Nat. arr. Br. pl. i, 734 (1821). HOOK. Fl. Scot. P. 2, 132 (1821), Br. Fl. ii, 37 (1833). HUEBEN. Musc. germ. 226 (1833). MACK. Fl. hib. P. 2, 22 (1836). HARTM. Skand. Fl. Fl. Dan. t. 2310, f. 1. RABENH. Deutsch. Kr. Fl. ii, S. 3, 140 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 22, t. 9 (1847). WILS. Bry. Brit. 72, t. 16 (1855). DE NOT. Epil. Briol. ital. 634 (1869). HUSN. Mouss. nord-ouest 50 (1873). HOBK. Syn. Br. m. 42 (1873).

Bryum cerviculatum DICKS. Pl. cr. fasc. iii, 7 (1795). WITH. Bot. arr. Br. veg. 3 ed. iii, 813 (1796). ABBOT Fl. Bedf. 237 (1798). HULL Br. Fl. P. 2, 257 (1799).

Bryum uncinatum DICKS. Op. c. iv, 11, t. 11, f. 8 (1801).

Dicranum uncinatum SM. Fl. Br. 1207. Eng. Bot. t. 2261. BRID. Sp. musc. 224.

Dicranum flavidum WEB. MOHR Reis. Schwed. 128 (1804). SCHWAEG. Suppl. I, P. I, 192, t. 44 (1811). Eng. Bot. t. 2261.

Oncophorus cervic. BRID. Bry. un. i, 391 (1826).

Ångstroemia cervic. C. MUELL. Synops. i, 430 (1849).

Dicranella cervic. SCHIMP. Coroll. 13 (1855), Synops. 72 (1860) et 2 ed. 73 (1876). BERK. Handb. Br. m. 282 (1863). MILDE Bry. Siles. 58 (1869).

Dioicous; in dense, widely extended, yellowish green patches; leaves semivaginant at base, flexuoso-patent or secund, lanceolate-subulate, concave, entire, glossy; nerve flattened, dilated at base; cells elongated hexagono-rectangular. Capsule on a yellow seta, cernuous, ovate, gibbous, with a short slightly strumose neck, not striate, yellow-brown, when old fuscous; annulus of a single row of cells; lid long as capsule, conoid, rostrate; teeth of peristome dull red.

Male plant smaller, bracts ovate, concave at base, linear-subulate.

HAB.—Wet heaths and sides of ditches; frequent. Fr. 6—7.

Var. *β.* **pusilla** (*Hedw.*) *Schimp.*

Stems short, simple, leaves smaller, suberect; capsule smaller, less gibbous.

SYN.—*Dicranum pusillum* HEDW. Stirp. ii, 80, t. 29, f. 13. Sp. musc. 139. SCHRAD. Sp. Fl. germ. 91. BRID. op. cit. SWARTZ op. c. 38. SCHWAEGR. op. c. 193. SM. Fl. Br. 1219; Eng. Bot. t. 2491.

Bryum parvulum DICKS. Pl. cr. fasc. 3, p. 7. HOFFM. Deutsch. Fl. ii, 34. WITH. HULL.

Dicran. cerviculatum Var. pusillum WEB. MOHR Tasch. 193. HOOK. TAYL. WILS. HUEBEN.

Oncophorus pusillus BRID. Bry. univ. i, 390.

Dicranella cervic. Var. *β. pusilla* SCHIMP. l. c.

HAB.—In similar localities as the type and sometimes intermixed with it.

This species is readily known by the neat roundish capsules, strumose at base, and is attached to bare spots where peat has been cut.

6. ANISOTHECIUM MITT.

(Journ. Lin. Soc. Bot. xii, 39 (1869).)

Mosses resembling *Dicranella* in habit; leaves gradually narrowed, or from a sheathing base abruptly subulate, carinate, with the margin plane or recurved, and nerve narrow and well defined below. Capsule always smooth, pachydermous, curved as in *Hypnum*, rarely suberect or less oblique, the cells of the exothecium regularly rectangular-quadrate, with non-flexuose walls. Peristome larger, thicker, deep purple, more papillose. (*Lindberg*).—Deriv. ανισος unequal, ζηκη a capsule.

CLAVIS TO THE SPECIES.

Leaves not sheathing, erecto-patent.	
Capsule cernuous, curved.	*rubrum.*
Capsule suberect, ovate.	*rufescens.*
Leaves from a sheathing base, squarrose.	
Leaves abruptly subulate.	
Neck of capsule substrumose, apex of leaf entire.	*Grevillei.*
Neck of capsule equal, apex of leaf serrulate.	*crispum.*
Leaves broad, obtuse.	*squarrosum.*

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1. ANISOTHECIUM RUBRUM (*Huds.*) *Lindb.*

Dioicous; small, simple; leaves erecto-patent, lanceolate-subulate, nerve slightly excurrent. Capsule cernuous, ovate, subincurved, rufous; seta red; lid large, short-beaked. (T. XVI, B.)

SYN.—*Bryum trichoides, obscure virescens, capitulis cernuis.* DILL. Cat. Giss. 226 (1719), et in RAY Synops. 3 ed. 100 (1724).

Bryum trichoides, capsulis rubris cernuis. DILL. Hist. musc. 390, T. 50, f. 59 (1741): et herbar.

Bryum rubrum HUDS. Fl. Angl. 413 (1762). L. Mant. alt. 309 (1771). GMEL. Syst. nat. ii, 1331 (1791). LAICH. Pl. Eur. 473 (1794).

Bryum simplex L. Sp. pl. 2 ed. ii, 1587 (1763); Syst. nat. ii, 702. NECK. Meth. musc. 202 (1771). HUDS. op. c. 2 ed. 486 (1778). EHRH. Hann. mag. 1780, p. 236. ROTH Fl. germ. i, 474 (1788). HOFFM. Deutsch. Fl. ii, 35 (1796).

Dicranum simplex HEDW. Fund. P. 2, 92 (1782). SIBTH. Fl. Oxon. 282 (1794).

Fuscina simplex SCHRANK Baiers. Fl. ii, 453 (1789), Fl. Salisb. n. 828.

Dicranum varium HEDW. St. cr. ii, 93, t. 34 (1789), Sp. musc. 133 (1801). ROTH Fl. Germ. iii, 370 (1795). BRID. Musc. rec. ii, P. I, 169 (1798), Sp. musc. I, 187 (1806), Mant. 61 (1819), Bry univ. i, 435 (1826). SWARTZ Musc. suec. 57 (1798). ROEHL. Moosg. Deutsch. 370 (1800), Deutsch. Fl. iii, 71 (1813). SM. Fl. Brit. iii, 1209 (1804), Eng. Bot. t. 1215. TURN. Musc. hib. 65 (1804). P. BEAUV. Prodr. 55 (1805). SCHULTZ Fl. Starg. 300 (1806). WEB. MOHR Bot. Tasch. 286 (1807). SCHWAEGR. Suppl. I, P. I, 174 (1811). WAHLENB. Fl. lapp. 341 (1812), Fl. carp. 346. VOIT Musc. herb. 47 (1812). MART. Fl. cr. Erl. 99 (1817). HOOK. TAYL. Musc. Brit. 58, t. 17 (1818); FUNCK Moost. 28, t. 20 (1821). GRAY Nat. arr. Br. pl. i, 738 (1821). HOOK. Fl. scot. P. 2, 134 (1821); Br. Fl. ii, 42 (1833). HUEBEN. Musc. germ. 260 (1833). MACK. Fl. hib. P. 2, 24 (1836). HARTM. Skand. Fl. DE NOT. Syll. musc. n. 295 (1838). Fl. Dan. t. 2310, f. 2. RABENH. Deutsch. Kr. Fl. ii, S. 3, 140 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 20 t. 10 (1847). WILS. Bry. Brit. 70, t. 17 (1855). HUSN. Mouss. nord-ouest 50 (1873). HOBK. Syn. Br. m. 42 (1873).

Dicranum rigidulum SWARTZ op. c. 38 et 89, t. 3, f. 7. HEDW. Sp. musc. 134, t. 32, f. 8-12. SM. Fl. Br. 1211: Eng. Bot. t. 1439. TURN. Musc. hib. 62. BRID. Sp. musc. I, 186; Mant. 61; Bry. univ. i, 433. WEB. MOHR Bot. Tasch. 188. SCHWAEGR. Suppl. I, P. I, 174. SCHULTZ Suppl. Fl. Starg. 72.

Dicranum varium α. *viride* HOOK. TAYL. Musc. Brit.

Ångstroemia varia C. MUELL. Synops. i, 435 (1849).

Dicranella varia SCHIMP. Coroll. 13 (1855), Synops. 72 (1860), et 2 ed. 74 (1876). BERK. Handb. Br. m. 282 (1863). MILDE Bry. Siles. 59 (1869). DE NOT. Epil. Bri. ital. 639 (1869).

Anisothecium varium MITT. op. c. 40.

Anisothecium rubrum LINDB. Utk. till en nat. grupp. Eur. bladm. med topps. frukt 33 (1878).

Dioicous; short, yellowish green, densely gregarious, or cæspitose, dividing at base. Leaves erecto-patent, rarely subsecund, oblong at base, not sheathing, gradually lanceolate-subulate, carinate, entire or obsoletely denticulate at apex, opake, nerve semiterete, slightly excurrent; cells thin, elongated; perich. bracts semivaginant. Seta deep red. Capsule cernuous, ovate, subincurved, reddish-brown, exannulate, contracted below the mouth after the lid falls; lid large, short-beaked; peristome large, deep purple, connivent. Male plant smaller, bracts ovate-subulate.

HAB.—Damp clay fields, banks of ditches, sometimes on rocks; common. Fr. 10—2.

Var. β. **tenuifolium** (*Bruch*).

Leaves more distant, thinner, narrower, obsoletely nerved, the points less elongated, the cells laxer. Capsule nearly symmetric, paler and thinner.

SYN.—SCHIMP. Bry. eur. et Synops. WILS. Br. Brit.

Dicranum subulatum SM. Eng. Bot. t. 1273.

Dicranum tenuifolium BRUCH. in F. MUELL. Musc. Sardois.

Dicranella fallax WILS. MSS.

HAB.—Anglesea and Bangor ferry (*Wilson*)!! Cotterall Clough (*Wilson*). By the Esk, Yorks. (*Spruce* 1842)! Parkgate, Cheshire (*Miss Jelly*)!! Henfield (*Borrer*)! Milnthorpe (*Barnes*)! Banchory (*Sim*).

Usually taller than the ordinary form with a longer seta and more drooping capsule, but not affording any permanent characters for specific distinction; it is most frequent in Southern Europe.

Var. γ. **tenellum** *Schimp.*

Stem slender, nearly simple, leaves falcato-secund, narrower, more laxly areolate, margin remotely toothed.

SYN.—SCHIMP. Bry. eur. et Synops. WILS. Bry. Brit.

HAB.—In drier grassy places, with the normal form.

Var. δ. **callistomum** (*Dicks.*)

Stem branched; leaves patent. Capsule on a short seta, erect, minute, truncate-obovate; lid broadly conical, almost as large as capsule.

SYN.—*Bryum callistomum* DICKS. Cr. Brit. fasc. 3, p. 5, t. 7, f. 10 (1795). HULL Br. Fl. P. 2, 258. WITH. 3 ed. iii, 818. BRID. Musc. rec. ii, P. III, 57.

Dicranum callistomum SM. Fl. Brit. iii, 1211. TURN. Musc. hib. 63. BRID. Sp. musc. I, 187.

Dicran. rigidulum β. *callistomum* BRID. Mant. 61; Bry. univ. i, 434.

Dicranella varia var. δ. *callistoma* SCHIMP. Syn. 73.

HAB.—On rocks in subalpine districts.

Scotland (*Dickson*). Anglesea (*Davies*). Near Derry and Colin Glen (*Scott* 1802).

This species is very variable in size and tint, and several forms may be found growing together in one tuft.

2. ANISOTHECIUM RUFESCENS (*Dicks.*) *Lindb.*

Dioicous; simple, rufescent; leaves secund, lineal-lanceolate, remotely toothed, laxly areolate; nerve strong, vanishing at apex. Capsule erect, ovate; lid widely conic, acutely pointed. (T. XVI, C.)

SYN.—*Bryum rufescens* DICKS. Pl. crypt. fasc. 3, p. 6, t. 8, f. 1 (1795). WITH. Bot. arr. Br. veg. 3 ed. iii, 818 (1796). HULL Br. Fl. P. 2, 258 (1799). BRID. Musc. rec. ii, P. III, 55 (1803).

Dicranum rufescens SM. Eng. Bot. t. 1216 (1804), Fl. Brit, iii, 1210 (1804). TURN. musc. hib. 66 (1804). BRID. Sp. musc. I, 188 (1806), Bry. univ. i, 437 (1826). SWARTZ in SCHRAD. Bot. Journ. iv. 173 (1801). MART. Fl. cr. Erl. 85 (1817). HUEBEN. Musc. germ. 264 (1833). DE NOT. Syllab. n. 296 (1838). RABENH. Deutsch. Kr. Fl. ii, S. 3, 140 (1848). BR. SCH. Bry. Eur. fasc. 37-40, p. 22, t. 12 (1847). WILS. Bry. Brit. 71, t. 12 (1855). HOBK. Syn. Br. m. 43 (1873). HUSN. Mouss. nord-ouest 50 (1873).

Dicranum carneum BLANDOW in STURM Deutsch. Fl. 2, n. 10.

Dicranum varium β. *rufescens*. ROEHL. Deutsch. Fl. iii, 71 (1813). HOOK. TAYL. Musc. Br. 58, t. 17, fig. med. (1818). BRID. Mant. 62 (1819). GRAY Nat. arr. Br. pl. i, 738 (1821). HOOK. Fl. Scot. P. 2, 134 (1821); Br. Fl. ii, 42 (1833).

Angstroemia rufesc. C. MUELL. Synops. i, 436 (1849).

Dicranella rufesc. SCHIMP. Coroll. 13 (1855), Synops. 74 (1860), et 2 ed. 75 (1876). BERK. Handb. Br. m. 283 (1863). MILDE Bry. Siles. 60 (1869). DE NOT. Epil. Bri. ital. 639 (1869).

Dioicous; rufescent, densely gregarious or cæspitulose, slender, simple, erect; leaves less crowded, subfalcato-secund, lineal-lanceolate, remotely toothed; nerve strong, subterete at base, flattened above, vanishing in apex; cells lax, elongated, rectangular. Seta red. Capsule erect or inclined, very small, ovato-elliptic, rufous; annulus none; lid broadly conic, acutely apiculate. Peristome large, red. Male plant slender, inflor. terminal, antheridia numerous, orange, bracts ovate, subulate.

HAB.—Wet clay banks and stony ground; not rare. Fr. 9—11.

Scotland (*Dickson*). Killarney, Lough Bray and Kelly's Glen, Ireland. Henfield and Blackdown, Sussex (*Borrer* 1826)! Hurstpierpoint (*Mitten* 1847)! Blackburn, Prestwich Clough and Ashley (*Hunt*)!! Cockmill Wood, Whitby (*Braithwaite* 1850)!! Quirang, Skye (Hunt)! Banchory (*Sim*). Hampstead canal bank, Stafford (*Bagnall* 1870).

Readily known from *A. rubrum* by turning pale vinous red in drying; the male infl. is so conspicuous, that when growing alone it has the aspect of a *Phascum* in fruit.

3. ANISOTHECIUM GREVILLEI (*Br. Sch.*) *Lindb.*

Dioicous; leaves sheathing, suddenly subulate, flexuoso-patulous, glossy, entire; perich. longly sheathing. Capsule cernuous, obovate, subgibbous, with a tumid neck; lid subulate rostrate. (T. XVI, D.)

SYN.—*Dicranum Schreberianum* GREV. Scott. Cr. Fl. t. 116 (1824). HOOK. TAYL. Musc. Brit. 2 ed. 95, t. Suppl. 3. (1827). HOOK. Br. Fl. ii, 38 (1833).

Dicranum Schreberi var. *Grevilleanum* BRID. Bry. univ. i, 450 (1826).

Dicranum Grevilleanum BR. SCH. Bry. eur. fasc. 37-40, p. 19, t. 7 (1847). WILS. Bry. Brit. 69, t. 33 (1855). HUSN. Mouss. nord-ouest 49 (1873).

Ångstroemia Grevilleana C. MUELL. Synops. i, 439 (1849).

Dicranella Grevilleana SCHIMP. Coroll. 13 (1855), Synops. 70 (1860), et 2 ed. 71 (1876). BERK. Handb. Br. m. 281 (1863). DE NOT. Epil. Bri. ital. 640 (1869). HOBK. Syn. Br. m. 41 (1873).

Anisothecium Grevillei LINDB. op. c. 26 (1878).

Dioicous or autoicous? densely cæspitulose, glossy yellowish green; leaves from a wide sheathing base, suddenly narrowed into a flexuose-patulous subula, margin subundulate, quite entire or with 2 or 3 irregular serratures at apex; basal cells elongated, upper oblong; perich. bracts more sheathing. Capsule cernuous, on a purple seta, obovate or oval, subgibbous, faintly striated, solid, exannulate, with a short tumid or obsoletely strumose neck; lid with a subulate beak. Male infl. gemmiform, terminal; bracts convolute, lanceolate-subulate.

HAB.—Damp clay soil in mountain districts; rare. Fr. 9.

Old road in Gen Tilt, Blair Atholl (*Hooker and Greville* 1823) ! ! Glenshee (*Fergusson*).

Both Wilson and Schimper describe this moss as monoicous, but De Notaris (Epilogo p. 641) as dioicous, observing that he could detect no male infl. on fruiting plants, and this is also my experience both with original specimens from Glen Tilt, and Finland ones from Lindberg. The latter also have the lid conical and only slightly rostellate, so that it is evident this part varies considerably, as it is usually subulate and decurved.

4. ANISOTHECIUM CRISPUM (*Schreb.*) *Lindb.*

Dioicous; leaves from a dilated base, narrowly lanceolate, irregularly denticulate at point. Capsule ovate-oblong, cernuous, not striate; lid large, rostrate. (T. XVI, E.)

SYN.—*Dicranum crispum* SCHREB. Spic. Fl. Lips. 79 (1771). THUNB. Prodr. Fl. cap. ii, 174.

Dicranum Schreberi SWARTZ Musc. Suec. 37, t. 2, f. 6 (1798). HEDW. Sp. musc. 144, t. 33, f. 6-10 (1801). P. BEAUV. Prodr. 55 (1805). BRID. Sp. musc. i, 198 (1806), Mant. 64 (1819), Bry. Univ. i, 449 (1826). SCHULTZ Fl. Starg. 199 (1806). WEB. MOHR 184 (1807). SCHWAEGR. Suppl. I, P. I, 179 (1811). VOIT Musc. herbip. 45 (1812). WAHLENB. Fl. lapp. 340 (1812), Fl. carp. 345 (1814). ROEHL. Deutsch. Fl. iii, 74 (1813). MART. Fl. cr. Erl. 103 (1817). HUEBEN. Musc. germ. 262 (1833). HARTM. Skand. Fl. RABENH. Deutsch. Kr. Fl. ii, S. 3, 139 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 18, t. 6 (1847). WILS. Bry. Brit. 69 (1855). HUSN. Mouss. nord-ouest 49 (1873).

Dicranum recognitum ROEHL. Moosg. Deutsch. 377 (1800).

Ångstroemia Schreberi C. MUELL. Synops. i, 438 (1849).

Dicranella Schreberi SCHIMP. Coroll. 13 (1855), Synops. 70 (1860), et 2 ed. 72 (1876). BERK. Handb. Br. m. 281 (1863). MILDE Bry. siles. 57 (1869). Hobk. Syn. Br. m. 42 (1873).

Anisothecium crispum LINDB. op. c. 26 (1878).

Dioicous; gregarious and cæspitulose, ½—1 in. high; yellowish green. Leaves squarrose, from a dilated semivaginant base, narrowly lanceolate, carinate, irregularly denticulate toward apex, not glossy; areolation firm, narrow, elongated; perich. bracts more shortly sheathing. Capsule on a purple seta, cernuous, oblong with scarce any neck, not striate, exannulate; lid conic, obliquely rostrate, large, purple; peristome purple. Male plant small, simple.

HAB.—Damp clay soil, sides of ditches and bare places in fields; not common. Fr. 9.

Mangerton (*Miss Hutchins*). S. of Ireland (*Mackay*). Loch More, Ross (*Hooker* 1828)! Glen Lena, Argyle (*Hooker* 1837)! Cauldron Snout, Teesdale (*Black* 1854)! Ramsden Clough, Todmorden (*Nowell*)!! Banks of R. Bollin at Bowdon and Ashley (*Hunt* 1864)!! Lancaster (*Hunt* 1865)! Rochdale (*Holt* 1878)!! Killin and Stirling (*Holt* 1880)!!

Var. β. **elatum** (*Schimp.*)

Densely cæspitose; much taller; leaves broader, more laxly areolate, more distinctly serrated.

SYN.—*Dicranella Schreberi* Var. β. *elata* SCHIMP. Synops. 2 ed. 72.

Dicranella lenta WILS. MSS.

HAB.—Stirrup wood, Mottram (*Nowell* 1860)! Walton Swamp, Warrington (*Wilson*)!! Broken brow, Prestwich (*Hunt* 1863)!! By R. Bollin at Ashley (*Hunt*)! Near Melrose (*Ferdon*)! The Dran, Rochdale (*Holt* 1880)!!

The variety exactly resembles in appearance a poor starved form of the next species, but is readily separated by the structure of the leaf point; fertile specimens are rare and approach nearer the typical form.

5. ANISOTHECIUM SQUARROSUM (*Starke*) *Lindb.*

Dioicous; tall, robust. Leaves squarrose, broadly oblong at base, oblongo-lanceolate, obtuse and eroso-crenulate at apex; nerve narrow, vanishing at apex. Capsule cernuous, ovate, with a short neck, lid conic, obtuse. (T. XVI, F.)

SYN.—*Muscus trichoides palustris, capsulis erectis, foliis reflexis* DOODY. RAY Syn. St. Brit. 2 ed. app. 338 (1696).

Bryum erectis capitulis brevibus, foliis reflexis DILL. in RAY Syn. 3 ed. 95, n. 18 (1724); Hist. musc. 365, T. 46, f. 24 (1741).

Bryum pellucidum β. L. Sp. pl. ii, 1118 (1753).

Bryum palustre DICKS. Pl. crypt. fasc. iv, 11 (1801).

Dicranum squarrosum STARKE in. litt. SCHRAD. Journ. Bot. v, 68 (1802). SM. Fl. Brit. iii, 1215 (1804); Eng. Bot. t. 2004. TURN. Musc. hib. 69 (1804) BRID. Sp. musc. i, 194 (1806); Mant. 55 (1819). WEB. MOHR Bot. Tasch. 183 (1807). SCHWAEGR. Suppl. I, P. I, 182, t. 47 (1811). VOIT Musc. herbip. 49 (1812). ROEHL. Deutsch. Fl. iii, 73 (1813). HOOK. TAYL. Musc. Brit. 55, t. 17 (1818). FUNCK Moost. 30, t. 21 (1821). GRAY Nat. arr. Br. pl. i, 736 (1821). HOOK. Fl. Scot. P. 2, 133 (1821.); Br. Fl. ii, 40 (1833). HUEBEN. Musc. germ. 271 (1833). MACK. Fl. hib. P. 2, 23 (1836). RABENH. Deutsch. Kr. Fl. ii, S. 3, 138 (1848). BR. SCH. Bry. eur. fasc. 37-40, p. 17, t. 5 (1847). WILS. Bry. Brit. 68, t. 17 (1855). HUSN. Mouss. nord-ouest 49 (1873). HOBK. Syn. Br. m. 42 (1873).

Oncophorus squarrosus BRID. Bry. univ. i, 404 (1826).
Diobelon squarrosum HAMPE in litt.
Ångstroemia squarrosa C. MUELL. Synops. i, 438 (1849).
Dichodontium squarrosum SCHIMP. Coroll. 13 (1855).
Dicranella squarrosa SCHIMP. Synops. 71 (1860), et 2 ed. 72 (1876). BERK. Handb. Br. m. 281 (1863). MILDE Bry. siles. 58 (1869). DE NOT. Epil. Bri. ital. 642 (1869).

Dioicous; cæspitose, 1—4 in. high, soft, bright green or yellow-green, fuscous at base; stem erect, sparingly branched. Leaves lax, flaccid, squarrose, octofarious, from an erect broadly oblong, sheathing base, divaricate, reflexed, oblongo-lanceolate, muticous or pointed, the margin wavy, the apex eroso-crenulate, nerve narrow, vanishing at apex, smooth, rather glossy; areolation lax, hexagono-rectangular above, elongated at base, with a sinuous primordial utricle; perich. bracts resembling the leaves. Capsule on a stout purple seta, cernuous, ovate with a short neck, subturgid, solid, fuscous brown; annulus none; lid conic, obtuse; peristome large purple, 2—3-fid to the middle.

Male plants similar, the infl. capituliform, bracts concave, broadly lanceolate, paraphyses numerous.

HAB.—Stony ground and by streamlets on moors; common, not frequent in fruit. Fr. 8—9.

In fr. Loch Broom (*Borrer*)! Staley brushes (*Hobson*). Ramsden Clough (*Nowell* 1864)!! Ogden Clough (*Scholefield*)! Quirang, Skye (*Hunt* 1863)! Rattand Clough, Todmorden (*Hunt* 1869)!! Hill bell, Westmoreland (*Stabler* 1868)! Den of Lawers (*Braithwaite* 1865)!! Saltersgate beck, Yorks. (*Rev. J. F. Crouch*)!! Wheeldale, Yorks. (*Braithwaite*)!! Cautley spout, Yorks. (*West* 1879)!!

The lively green tufts of this moss in the barren state, are a conspicuous ornament to our moorlands, and much more robust than the fertile plant, which is attached to gravelly clay where water stagnates. In habit it differs considerably from the species which precede it.

Subf. 3. *SELIGERIEÆ.* Plants small; scarcely branched; leaves smooth, narrowly lanceolate-subulate, minutely areolate above, laxer below, without distinct basal angular cells, or sometimes with them. Peristome of 16 lanceolate flat smooth teeth, entire, sometimes cleft or perforated, or none.

7. SELIGERIA. BR. SCHIMP.

Bry. Eur. Fasc. 33—36 (1846).

Plants very small, gregarious or cæspitant, growing on rocks. Leaves in many rows, lanceolate or subulate, nerved, cells minute and quadrate above, large and rectangular at base, sometimes with colored angular cells as in *Dicranum*. Calyptra cucullate, capsule ovate or globose with a distinct neck, often turbinate when empty, peristome of 16 lanceolate flat smooth rigid teeth, rarely cleft, sometimes none; spores smooth.—Deriv. After the Silesian pastor Seliger.

The pretty little species which constitute the genus *Seligeria* have a great resemblance to each other and require care to discriminate. Besides our native species there are also found in Europe *S. crassinervis* LINDB.—*diversifolia* LINDB. and *subimmersa* LINDB. from Scandinavia, with *S. polaris* BERGGR. from Spitzbergen; the two latter have colored angular cells as in *Dicranum*, and form the transition to the genus *Blindia*.

CLAVIS TO THE SPECIES.

Peristome none.	*Donii.*
Peristome present.	
Seta straight when moist.	
Capsule turbinate.	
Leaves ovato-lanceolate, rather obtuse.	*calcarea.*
Leaves lanceolate, subulate.	
Perich. bracts reaching to capsule.	*acutifolia.*
Perich. bracts not reaching capsule.	
Leaves shortly lanceolate, in 3 ranks.	*trifaria.*
Leaves longer, setaceous in upper half.	*pusilla.*
Capsule narrowly pyriform.	*paucifolia.*
Seta arcuate when moist.	*setacea.*

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1. SELIGERIA DONII (*Sm.*) *C. Muell.*

Autoicous; leaves lanceolate, subulate, minutely serrate at base. Capsule erect, truncate, ovate, gymnostomous; lid broadly conic. (T. XVI, G.)

SYN.—*Gymnostomum Donianum* SM. Eng. Bot. t. 1582 (1806). HOOK TAYL. Musc. Br. 13, t. 7 (1818). GRAY Nat. arr. Br. pl. i, 716 (1821). HOOK. Fl. scot. P. 2, 123 (1821); Br. Fl. ii, 10 (1833). BRID. Bry. univ. i, 66 (1826). SCHWAEGR. Suppl. III, P. I, 6, t. 207 (1827).

Anodus Donianus BR. SCHIMP. Bry. eur. fasc. 33-6, p. 3, t. 1 (1846). RABENH. Deutsch. Kr. fl. ii, S. 3, 131 (1848). WILS. Bry. br. 56, t. 7 (1855). SCHIMP. Synops. 112 (1860); et 2 ed. 124 (1876). BERK. Handb. br. m. 287 (1863). HOBK. Syn. br. m. 38 (1873).

Seligeria Doniana C. MUELL. Syn. i, 420 (1849). HARTM. Skand. fl. 5 ed. 397 (1849). SPRUCE in Ann. Mag. Nat. hist. 2 ser. iii, 479 (1849). JURATZ. Laubm. Oester.-Ung. 68 (1882).

Seligeria Donii LINDB. in Oefver. K. Vet. akad. Foerhand. 1864, p. 187. MILDE Bry. Siles. 86 (1869). DE NOT. Epil. Bri. ital. 656 (1869).

Autoicous; very small, gregarious, yellowish-green; stem very short, simple. Leaves erect, straight, from an ovate-oblong serrulate base, lanceolate-subulate, deeply channelled, acute, crenulate; nerve occupying all upper part of subula; cells of base rectangular, incrassate, pellucid, upper smaller quadrate, chlorophyllose. Perich. bracts more obtuse, semivaginant at base; capsule on a straight yellowish seta, erect, minute, truncate-ovate, with a short tumid neck, pale olivaceous, leptodermous, gymnostomous, exannulate; lid broadly conic, suboblique, columella exserted after the lid falls. Male infl. on a basal branch, without paraphyses, bracts oblongo-lanceolate nerveless.

HAB.—On limestone and sandstone rocks. Fr. 8.

Den of Dupplin, Perth (*Don*)! Den of Airlie and Norran water (*Drummond*)! Glen Shira, Inverary (*Rev. C. Smith*)! Winch bridge, Teesdale (*Black* 1854)! Cawsey Dene; Newcastle (*Bowman*). Mowthorpe dale and Crambeck (*Spruce*)! Fern, Brechin (*Fergusson*) 1868. Blair Athol (*Miss McInroy* 1859)! Woolsonbury hill, Sussex (*Mitten* 1859). Rocks below Rolston Scar, Yorks. (*Baker* 1855). Todmorden, High green Wood, and Mitholme Clough, Heptonstall (*Nowell* 1854)!! Hardcastle crag, Hebden bridge (*Hunt* 1867)!! Castleton, Derby (Whitehead 1868)!!

One of the most elegant of our minute mosses, and probably often overlooked from its inconspicuous appearance.

2. SELIGERIA PUSILLA (*Ehrh.*) *Br. Schimp.*

Autoicous; very short. Leaves lanceolate-subulate, acute, faintly crenulate above, with minute pellucid areolation. Capsule pyriform, oval; lid conic, obliquely subulate. (T. XVI, H.)

SYN.—*Afzelia pusilla* EHRH. Pl. cr. n. 183 (1787), et Beitr. vii, 100 (1792).

Weissia pusilla HEDW. Stirp. cr. ii, 78, t. 29 (1789), Sp. musc. 64 (1801). BRID. musc. rec. II, P. I, 76 (1798); Sp. musc. I, 114 (1806); Mant. 43 (1819); Bry. univ. i, 349 (1826). ROEHL. Moosg. Deutsch. 155 (1800); Ann. Wett. ges. iii, 106; et Deutsch. Fl. iii, 50 (1812). LA MARK & CAND. Fl. franc. i, 455 (1805). SCHWAEG. Suppl. I, P. I, 68 (1811). HOOK. TAYL. Musc. brit. 47, t. 15 (1818). FUNCK Moost. 14, t. 9 (1821). GRAY Nat. arr. br. pl. i, 732 (1821). NEES HORNSCH. Bry. germ. ii, 102, t. 34 f. 25 (1831). HOOK. Br. fl. ii, 23 (1833). HUEB. musc. germ. 142 (1833). MACK. Fl. hib. P. 2, p. 15 (1836). DE NOT. Syll. musc. 227 (1838).

Bryum pusillum HOFFM. Deutsch. fl. ii, 33 (1795).

Grimmia pusilla SCHRAD. Syst. samml. kr. gew. i, 10 (1796), et Journ. Bot. ii, P. I, 56 (1799). ROTH Tent. fl. germ. iii, P. I, 147 (1800). SM. Fl. brit. iii, 1184 (1804). WEB. MOHR Bot. Tasch. 140 (1807). SCHKUHR Deutsch. Kr. gew. P. 2, 57, t. 25 (1810).

Grimmia parasitica VOIT in STURM Deutsch. Fl. ii, heft 11 (1810).

Weissia parasitica ROEHL. Deutsch. Fl. iii, 51.

Seligeria pusilla BR. SCHIMP. Bry. eur. fasc. 33—6, mon. 4, t. 1 (1846). RABENH. Deutsch. Kr. Fl. ii, P. 3, 132 (1848). C. MUELL. Synops. i, 418 (1849). WILS. Bry. brit. 54, t. 15 (1855). SCHIMP. Synops. 113 (1860), et 2 ed. 124 (1876). BERK. Handb. br. m. 288 (1863). LINDB. in Oef. K. Vet. ak. 1864, p. 187. MILDE Bry. siles. 86 (1869). DE NOT. Epil. Bri. ital. 655 (1869). HUSN. mouss. nord-ouest 44 (1873). HOBK. Syn. br. m. 37 (1873). JURATZ. Laubm. Oesterr.—Ung. 68 (1882).

[*Grimmia Seligeri* WEB. MOHR Tasch. 140 et 459. *Weissia Seligeri* WAHL. Fl. lapp. 322 (1812). NEES HORNSCH. Bry. Germ. ii, 105, t. 34, f. 26, is a small dark green form with shorter leaves, according to Schimper's examination of an original specimen.]

Autoicous; in loose dwarf silky dark-green tufts. Stem very short, simple or divided; lower leaves short, narrowly lanceolate, upper long, lineal setaceous, margin minutely crenulate; nerve thin, vanishing at apex or slightly excurrent, wings very narrow, distinct to apex, cells at base pellucid, elongato-rectangular, upper smaller, quadrate, nearly empty. Perich. bracts semivaginant below, lanceolate-subulate, nerve narrower, indistinct at base; capsule erect, on a straight pale yellow seta, twisting to left when dry, ovate, olivaceous, when dry and deoperculate strongly turbinate, sulcate, fuscous; lid with an oblique subulate beak, teeth of per. orange, flat, remotely articulated, inflexed when moist, irregular at margin. Male infl. gemmaceous, on a distinct branch or at base of female, bracts minute, ovate, concave apiculate.

HAB.—Damp shady rocks of sandstone or limestone, not uncommon. Fr. 5—6.

Belfast (*Drummond*). Buxton (*Wilson*)! Malham (*Nowell* 1858)!! Rosedale Abbey and Goathland, Yorks. (*Braithwaite* 1858)!! Matlock (*Holmes*). Youlgreave, Derby (*Bowman*). Gordale (*Hunt*)! Hampton rocks, Bath (*Hunt* 1867)!! Blair Atholl (*Miss McInroy*)! Levens Park (*Barnes*)!! Litton, Yorks (*Whitehead and Ashton* 1878)!! Castleton, Derby (*Whitehead* 1880)!! Dent, Yorks. (*West* 1879). Castleton, Braemar *Fergusson*).

Variable in size and colour, and also in the length and width of the leaves. Lindberg refers *Gr. Seligeri.* to *Sel. setacea* as a Var. *pumila*, yet in W. & M. we find "A *Grimm. recurvata* foliorum figura, seta madida recta," and have therefore followed Schimper on this point.

3. SELIGERIA ACUTIFOLIA *Lindb.*

Autoicous; resembling *S. pusilla*. Leaves more acutely subulate. Capsule larger, scarce emerging above the elongated perichætial bracts. (T. XVI, I.)

SYN.—*Seligeria acutifolia* LINDB. in HARTM. Skand. fl. 9 ed. ii, 75 (1864), et in Not. ur Sällsk. Fl. Fn. fenn. förh. ix. 261 (1868); Musc. Scand. 26 (1879). BRAITHW. in Journ. Bot. 1870, p. 226. HOBK. Syn. br. m. 37 (1873).

Sel. pusilla β. *Lacroixiana* DE NOT. Epil. Briol. ital. 656 (1869).

Sel. pusilla Var. β. *acutifolia* SCHIMP. Syn. 2 ed. 125 (1876).

Autoicous, very small, deep green. Upper leaves and perich. bracts from a more or less sheathing base, abruptly narrowed into a subterete, setiform, very acute, fragile, crenulate subula, formed almost entirely by the nerve; cells all rectangular and pellucid. Seta very short and slender, capsule small, the mouth scarce overtopping the apices of perich. bracts, leptodermous, pale and pellucid, shortly pyriform with a short neck, turbinate and wide mouthed when empty; lid with a very short, scarcely oblique beak; teeth of per. short, rather obtuse.

Var. β. **longiseta** *Lindb.*

Plant larger, with a longer seta elevating the capsule beyond the perich. bracts; lid with a longer oblique beak.

SYN.—*Sel. pusilla* Var. *fol. perich. longioribus setaceis* WILS. MSS.

Sel. acutifolia Var. β. *longiseta* LINDB. in Not. Sällsk. Fl. Fn. fenn. l. c. et in Journ. Lin. Soc. xi, 467 (1870).

HAB.—Fissures of calcareous rocks. Fr. 5—6.

The Var β. at Lover's leap near Buxton (*Wilson* 1831). Arncliff, Yorks. (*Whitehead* 1868)!! Ashwood dale and near Warmhill, Cheedale (*Whitehead* 1880)!! Tideswell dale, Derby (*Whitehead* 1881)!!

The type of the species was first found in the island of Gotland, and does not occur here; it stands intermediate between *S. paucifolia* and *S. pusilla*, agreeing with the former in the leaves and bracts, and with the latter in the capsule; a gradual transition into the more elongated form takes place, but all our British specimens have the rostellate lid.

4. SELIGERIA TRIFARIA (*Brid.*) *Lindb.*

Autoicous, densely cæspitose, resembling *S. pusilla*, leaves in three ranks, straight, lanceolate-subulate, rather obtuse, short; capsule thicker. (T. XVI, K.)

SYN.—*Weissia trifaria* BRID. in SCHRAD. Journ. Bot. iii, P. II, 283 (1801).

Weissia tristicha BRID. Sp. musc. I, 116 (1806); Mant. 44 (1819); Bry. univ. i, 355 (1826). ROEHL. Deutsch. Fl. iii, 50 (1813); Ann. Wett. Gesells. iii, 107. NEES HORNSCH. Bry. germ. ii, S. 2, 108. T. 34, f. 28 (1831). MONT. in Arch. de Bot. i, 213 (1833). HUEBEN. Musc. germ. 145 (1833). DE NOT. Syll. musc. 228 (1838).

Grimmia trifaria WEB. MOHR Bot. Tasch. 143 et 460 (1807). SCHKUHR Deutsch. kr. gew. P. II, 58, t. 25 (1810).

Grim. tristicha SCHWAEGR. Suppl. I, P. I, 84, t. 26 (1811). KAULF. in STURM Fl. germ. 2, 16. FUNCK Moost. t. 12 (1821).

Selig. tristicha BR. SCH. Bry. eur. f. 33—6, mon. 5, t. 2 (1846). RABENH. Deutsch. Kr. Fl. ii, S. 3, 132 (1848). C. MUELL. Syn. i, 420 (1849). SCHIMP. Synops. 114 (1860) et 2 ed. 126 (1876). BERK. Handb. br. m. 289 (1863). MILDE Bry. siles. 87 (1869). DE NOT. Epil. 654 (1869). HOBK. Syn. br. m. 37 (1873). JURATZ. Laubm. Oesterr.—ung. 69 (1882).

Selig. trifaria LINDB. in Oefv. Vet. Akad. förh. 1863, p. 413, et 1864, p. 189.

Autoicous; densely cæspitose, dull yellow-green, rather rigid, slender, with fastigiate branches. Leaves in three ranks, crowded, straight, erect, from a lanceolate concave whitish base, gradually narrowed into a short broad obtuse entire subula: nerve thin below, dilated above; cells pellucid, large and elongato-rectangular at base, quadrato-rectangular and incrassate above. Perich. bracts longer, the nerve excurrent in a longer subula, slightly recurved at apex. Capsule on a yellow seta, pachydermous, subspherical with a swollen neck, when dry and deoperculate, truncate smooth brownish-yellow; lid large, orange, with a long oblique acute beak; teeth of per. bright red, narrower, sometimes perforated.

HAB.—Dripping calcareous rocks; very rare. Fr. 5—6.

Glent Tilt, Blair Athole, with *S. pusilla* (*Miss McInroy* 1858)!! Litton, Yorks. (*Ashton* and *Whitehead* 1878)!! Miller's dale, Derby (*Cunliffe* 1880)!!

The longer slender branches, which in the moist state show distinctly the trifarious arrangement of the leaves, afford a ready means of identification.

5. SELIGERIA PAUCIFOLIA (*Dicks.*) *Carruth.*

Autoicous; very short. Leaves lanceolate below, subulate above, with larger areolation. Capsule on a long seta, oblong, small mouthed, subcernuous; lid with a long slender beak. (T. XVII, A.)

SYN.—*Bryum paucifolium* DICKS. Cr. brit. fasc. 4, p. 7, t. 11, f. 3 (1801).

Gymnostomum paucif. SMITH Eng. Bot. t. 2506 (1813).

Seligeria calcicola MITT. MSS. et in SEEM. Journ. Bot. ii, 194, t. 19, f. 1—6 (1864). BERK. Handb. br. m. 289 in obs.

Sel. calycina MITT. MSS. LINDB. in Oefv. v. ak. Förh. xxi, 188 (1864).

Sel. subcernua SCHIMP. Bry. eur. Suppl. fasc. 1—2. t. 1 (1864); Synops. 2 ed. 128 (1876).

Sel. paucifolia CARRUTH. in Journ. Bot. iv, 39 (1866). BRAITHW. in Journ. Bot. 1870, p. 226. HOBK. Syn. br. m. 37 (1873).

Autoicous; densely gregarious, pale green; stem very short, simple. Leaves crowded, erecto-patent, lowest lanceolate, upper from a narrowly oblong base, longly subulate, quite entire; nerve vanishing at base, gradually stronger, semiterete, faint but distinct nearly to end

of subula; perich. bracts broader at base with shorter points; cells rectangular pellucid. Capsule light brown, on a longish pale yellow seta, pachydermous, narrowly elliptic, occasionally somewhat asymmetric with a small mouth, slightly cernuous; lid pale red, with a long slender slightly oblique pale beak; teeth of per. purple, lanceolate, remotely articulate. Male infl. at base, bracts three, short.

HAB.—Detached chalk blocks partially imbedded in soil, rare. Fr. 5—6.

On brick rubbish, Wetherby, Yorks. (*Dickson*)! On chalk, north side of S. Downs, Sussex. Stanmer (*Jenner* 1840)!! Woolsonbury hill (*Mitten*)! Lewes (*Unwin*)!! Box hill, Surrey (*Mitten*). Dunton Green, Kent (*Holmes*).

Schimper recognized original specimens of Dickson's *B. paucifolium* to be this plant, yet he makes no reference to it in his publications, though Mr. Carruthers has given a clear history of the species in his paper in Journ. Bot. Dickson's figure is very incomplete, and it is probable that he distributed for *B. paucifolium*, other small mosses which resembled it. It is best distinguished by the elongated capsule, which becomes darker and more pyriform when old.

6. SELIGERIA CALCAREA (*Dicks.*) *Br. Sch.*

Autoicous; resembling *S. pusilla*. Leaves ovate at base, narrowly lanceolate, rather obtuse. Capsule larger, turbinate. (T. XVII, B.)

SYN.—*Bryum calcareum* DICKS. Pl. cr. Brit. fasc. II, 3, t. 4, f. 3 (1790). RELH. Fl. Cant. Suppl. 3, p. 9 (1793). SM. Eng. Bot. t. 191 (1794). WITH. Bot. arr. br. veg. 3 ed. iii, 812 (1796). ABBOT Fl. Bedf. 243 (1798). HULL Br. Fl. P. 2, 257 (1799).

Grimmia calcarea SM. Fl. Brit. iii, 1187 (1804). TURN. musc. hib. 25 (1804).

Weissia calcarea HEDW. Sp. musc. 66, t. 11, f. 1—5 (1801). BRID. Sp. musc. I, 115 (1806), Mant. 43 (1819), Bry. univ. i, 351 (1826). SCHWAEGR. Suppl. I, P. I, 115 (1811). ROEHL. Deutsch. Fl. iii, 50 (1813). HOOK. TAYL. Musc. Brit. 47, t. 15 (1818). FUNCK Moost. 13, t. 9 (1821). GRAY Nat. arr. Br. pl. i, 732 (1821). NEES HORNSCH. Bry. germ. ii, 2, p. 10, t. 31, f. 24 (1831). HUEBEN. Musc. germ. 144 (1833). HOOK. Br. Fl. ii, 23 (1833).

Seligeria calcarea BR. SCH. Bry. Eur. fasc. 33—36 p. 4, t. 1 (1846). RABENH. Deutsch. Kr. Fl. ii, S. 3, 132 (1848). C. MUELL. Syn. i, 419 (1849). WILS. Bry. Brit. 54, t. 15 (1855). SCHIMP. Synops. 114 (1860) et 2 ed. 125 (1876). BERK. Handb. Br. m. 288, t. 24, f. 2 (1863). LINDB. in Oefv. v. ak. Förh. 1864, p. 188. MILDE Bry. siles. 87 (1869). HOBK. Syn. Br. m. 38 (1873). HUSN. Mouss. nord-ouest 45 (1873).

Autoicous; densely gregarious, dull blackish green. Stem very short. Leaves short, broad, lower ovato-lanceolate, upper from an oval oblong base, abruptly narrowed into a rather obtuse shortish curved subula, quite entire; nerve flattish, faint at base, stronger toward apex and occupying all upper part; cells at base shortly rectangular, thin pellucid, upper quadrate, incrassate, highly chlorophyllose. Perich. bracts subvaginant, from a broadly oval base, longly acuminate, of laxer texture and with thinner nerve. Capsule on a thicker yellowish-brown seta, larger, more solid, the lid more shortly rostrate; teeth of per. broader and more obtuse, more densely articulate; spores larger. Male infl. with longer bracts.

HAB.—Chalk cliffs and calcareous rocks. Fr. 4—5.

Common in Kent, Sussex and Surrey. Newmarket heath (*Dickson*). Barton hill, Beds. (*Abbot*).

7. SELIGERIA SETACEA (*Wulf.*) *Lindb.*

Autoicous; with habit of *S. pusilla*. Leaves lanceolate-subulate. Capsule on a flexuose-arcuate seta, subpyriform oval, mouth narrower; lid subulate, nearly straight. (T. XVII, C.)

SYN.—*Bryum trichoides acaulon palustre minimum, setis et capsulis brevissimis* DILL. Hist. musc. 387, t. 49, f. 53 (1741), et herb.

Bryum paludosum L. Sp. pl. ii, 1119 (1753). HULL Br. Fl. P. 2, 257 (1799).

Bryum setaceum WULFEN in JACQ. Miscell. ii, 96, t. 12, f. 1 (1781). L. Syst. Veg. 949. GMEL. in L. Syst. nat. 13 ed. ii, 1331 (1790). HULL Br. Fl. P. 2, 265 (1799).

Grimmia recurvata HEDW. Stirp. i, 102, t. 38 (1787); Sp. musc. 75 (1801). BRID. Musc. rec. ii, P. I, 59 (1798); Sp. musc. I, 101 (1806). ROTH Fl. germ. iii, P. I, 141 (1800). ROEHL. Moosg. Deutsch. 122 (1800). SMITH Fl. brit iii, 1183 (1804); Eng. Bot. t. 1489. TURN. Musc. hib. 24 (1804). WEB. MOHR Bot. Tasch. 145 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 60, t. 25 (1810). SCHWAEGR, Suppl. I, P. I, 83 (1811). SCHLEICH. Cat. pl. helv. 29. MART. Cr. erl. 113 (1817). FUNK Moost. 16, t. 11 (1821).

Bryum recurvatum DICKS. Pl. cr. Brit. fasc. II, 7 (1790). HOFFM. Deutsch. Fl. ii, 31 (1795). WITH. Bot. arr. br. Veg. 3 ed. iii, 838 (1796).

Bryum Wulfenii LAICH. Pl. eur. 482 (1794).

Weissia recurvata ROEHL. Deutsch. fl. iii, 51 (1813); Ann. Wett. ges. iii, P. I, 101. WAHLENB. Fl. suec. ii, 757 (1826). HOOK. TAYL. Musc. brit. 47, t. 15 (1818). BRID. Mant. 43 (1819); Bry. univ. i, 352 (1826). HOOK. Fl. Scot. P. 2, 131 (1821). GRAY Nat. arr. Br. pl. i, 732 (1821). NEES HORNSCH. Bry. germ ii, S. 2, 97, t. 34, f. 27 (1831). HUEBEN. Musc. germ. 141 (1833). BALS. DE NOT. Pr. bry. Med. 140 (1834). MACK. Fl. hib. P. 2, 15 (1836). DE NOT. Syll. musc. 228 (1838). HOOK. Br. Fl. ii, 23 (1833).

Grimmia pusilla SM. Eng. bot. t. 2551.

Seligeria recurvata BR. SCH. Bry. eur. f. 33—6 Mon. p. 6, t. 3 (1846). RABENH. Deutsch. Kr. Fl. ii, S. 3, 133 (1848). C. MUELL. Syn. i, 419 (1849). WILS. Bry. brit. 55, t. 15 (1855). SCHIMP. Synops. 115 (1860), et 2 ed. 127 (1876). BERK. Handb. br. m. 289 (1863). DE NOT. Epil. 655 (1869). MILDE Bry. siles. 87 (1869). HOBK. Syn. br. m. 38 (1873). HUSN. Mouss. nord-ouest 45 (1873). JURATZ. Laubm. Oesterr.—ung. 70 (1882).

Selig. setacea LINDB. in Oefv. vet. ak. förh. 1863, p. 413 et 1864, p. 189.

Autoicous; widely cæspitose, olivaceous-green. Stem very short, fragile, simple or dichotomous. Lower leaves oblongo-lanceolate, upper from an erect ovato-lanceolate base, longly subulate, flexuose, acute, entire; nerve semiterete, longly excurrent; cells at base pellucid, elongated rectangular, above incrassate, subquadrate, chlorophyllose; perich. bracts from a sheathing base subulato-setaceous, all subflexuose. Calyptra rather large. Capsule on a slender yellowish seta, arcuate when moist, erect when dry, subspheric oval or oblong, with a swelling neck, inclined, leptodermous, yellow-brown with a red mouth; lid convexo-conic at base, with a straight subulate beak; teeth of per. lineal, obtuse or lanceolate, sometimes cleft at apex, deep orange. Male as in *S. pusilla*.

HAB.—Shaded sandstone rocks or stones. Fr. 4—5.

Forfar and Bilston burn (*Don*)! By the Calder and Kilbride, Glasgow. Brandon hill, Ireland (*Mackay*). Braemar (*Croall* 1856). Todmorden (*Nowell* 1858)!! Den of Airlie (*Coward* 1858)! Pentlands and Cleish hills (*Arnott*). Hardcastle crag (*Hunt* 1867)!! Greenfield, Yorks. (*Whitehead* 1867)!! Kentmere, Westmoreland (*Stabler* 1867)! Ashdown forest (*Holmes* 1877). Near Denbigh (*Davies*). Monsal Dale, Derby (*Whitehead* 1881)!! Devil's kitchen, Twll Dhu (*Holmes*)!!

This species may be readily distinguished from *S. pusilla* by its longer leaves and the seta becoming flexuose and arched when moist; the capsule also is smaller and more globose than in the other species.

8. BRACHYDONTIUM BRUCH.

(Fürnr. in Flora 1827, P. II, 37.)

Plants very small, densely gregarious; leaves resembling those of *Seligeria*. Calyptra mitriform, 5-lobed, conical. Capsule erect, oblong, substriate, with a very broad persistent annulus; teeth of per. confluent at base, broad, truncate, very short and thin, dotted, and with a few perforations.—Deriv. βραχυς short, οδους a tooth.

Schimper states that this genus was founded by Bruch, whose pupil Fürnrohr published the manuscript notes in Bruch's herbarium without acknowledgment, and perhaps for this reason afterwards altered the name to *Brachyodus*. The genus *Campylostelium*, usually associated with this, finds a more natural place with *Glyphomitrium*.

BRACHYDONTIUM TRICHODES (*Web. Mohr.*) *Fürnr.*

Autoicous; very small, simple. Leaves lanceolate-subulate, straight. Capsule cylindric-oblong, erect; lid convex, rostellate. (T. XVII, D.)

SYN.— *Gymnostomum trichodes* WEB. MOHR Ind. mus. pl. cr. 3 (1803) et Arch. syst. naturges. i, P. I, 124, t. 4, f. 1 a—d (1804); Bot. Tasch. 85 (1807). SCHKUHR Deutsch. kr. gew. P. II, 23, t. 10 (1810). ROEHL. Deutsch. Fl. iii, 39 (1813). BRID. Mant. 11 (1819); Bry. univ. i, 58 (1826). NEES HSCH. Bry. germ. i, 184, t. 12, f. 29 (1823).

Anœctangium trich. SCHWAEG. Suppl. I, P. I, 33, t. 10 (1811).

Grimmia trich. Eng. Bot. t. 2563 (1813).

Weissia trich. HOOK. TAY. Musc. br. 45, t. 15 (1818). GRAY Nat. arr. br. pl. i, 730 (1821). HUEBEN. Musc. germ. 138 (1833). HOOK. Br. Fl. ii, 21 (1833). MACK. Fl. hib. P. 2, 14 (1836).

Brachydontium trichodes FÜRNR. in Flora X, P. II, Beil. I, p. 37 (1827). MILDE Bry. siles. 89 (1869).

Brachyodus trichodes FÜRNR. op. c. p. 112, et xii, P. II, 594 (1829). NEES HSCH. Bry. germ. ii, P. II, 3, t. 25 (1831). BR. SCH. Bry. eur. f. 33—6, Mon. 3, t. 1 (1846). C. MUELL. Syn. 1, 416 (1849). WILS. Bry. br. 53, t. 14 (1855). SCHIMP. Syn. 117 (1860), et 2 ed. 132 (1876). BERK. Handb. br. m. 289, t. 24, f. 3 (1863). DE NOT. Epil. 667 (1869). HOBK. Syn. br. m. 36 (1873). JURATZ. Laubm. Oesterr.—ung. 71 (1882).

Autoicous; plants gregarious, minute, very slender. Leaves erecto-patent, lanceolate, the nerve excurrent in a semiterete slightly channelled subula; areolation quadrato-hexagonal above, rectangulo-hexagonal at base. Capsule oblong, cylindric, narrowed at base, indistinctly striate, when old plicate, leptodermous, pale brown; seta pale, slender, twisted to the right below and to the left above when dry; calyptra reaching half down capsule, conical, split into 3—5 lobes; annulus broad, of 3 series of large cells, separating in fragments; lid conic, red at base with a straight subulate beak; teeth 16, very irregular,

lanceolate, truncate, of 2—5 joints, perforated, pale, smooth; spores small, pale. Male infl. on a short radical branch, gemmaceous, bracts broad, ovate, nerveless.

HAB.—Wet sandstone rocks. Fr. 4.

Ben Buy and Ben Nevis (*Rev. C. Smith*). Greenfield, Yorks. (*Hobson* 1835)! Henfield and Black down, Sussex (*Borrer*)! Todmorden (*Nowell* 1849)! Park quarry, Castle Howard (*Baker* 1858)!! Tebay (*Barnes* 1868)! Alderley edge, Cheshire (*Whitehead* 1865)!! Bolton and Ainsworth (*Scholefield* 1861)! Grayrigg forest, Westmoreland (*Stabler* 1868)! Fern, Brechin (*Fergusson* 1868)! Westward, Cumbd. (*Rev. R. Wood* 1880)!! Near Lough Bray (*Taylor*). Kelly's Glen, Dublin (*Moore* 1863).

Subf. 4. *DICRANEÆ.* Plants small, or tall and robust; leaves lanceolate, often falcato-secund and serrated, glossy, smooth or sometimes papillose; cells narrow and elongate above, those at the basal angles larger, vesicular, colored or pellucid. Capsule often subcylindric and curved, lid rostrate, teeth of per. 16, solid, lanceolate, trabeculate, usually cleft or perforated in the divisural line, rarely wanting.

9. BLINDIA Br. Sch.

Bry. eur. f. 33—36 (1846).

Plants densely cæspitant, dichotomous, fastigiate; leaves quinquefarious, lanceolate-subulate, nerved, smooth, cells narrow, quadrate above, linear at base, with large, colored, vesicular angular cells. Calyptra dimidiate-cucullate; capsule immersed or exserted, subspherical with a turgid neck, pachydermous. Peristome none or simple, teeth 16, lanceolate, remotely jointed, slender, smooth, cartilaginous. Deriv.—After pastor Blind of Münster.

CLAVIS TO THE SPECIES.

Dwarf.	Capsule immersed, gymnostomous.	*cæspiticia.*
Taller.	Capsule exserted, peristomate.	*acuta.*

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1. **BLINDIA CÆSPITICIA** (*Schwaeg.*) *Lindb.*

Autoicous; leaves oblong, subulate, entire with hyaline points. Capsule immersed, gymnostomous. (T. XVII, E.)

SYN.—*Anœctangium cæspiticium* SCHWAEGR. in SCHRAD. neu Jour. iv, 13, t. II, A (1801); Suppl. I, P. I, 35, t. 12 (1811). FUNCK Moost. 7, t. 5 (1821). HOPP. HORNSCH. Pl. cr. Dec. 1 (1817).

Gymnostomum cæsp. WEB. MOHR Bot. Tasch. 77 et 453 (1807). SCHKUHR Deutsch. Kr. gew. 28, t. 11, c. (1810). Eng. Bot. t. 2778. HOOK. br. fl. ii, 6 (1833). HUEBEN. Musc. germ. 57 (1833). DE NOT. Syll. 288 (1838).

Schistidium cæsp. BRID. Mant. 21 (1819); Bry. un. i, 119 (1827). NEES HORNSCH. Bry. germ. i, 94, t. 8, f. 2 (1823).

Stylostegium cæsp. BR. SCH. Bry. eur. f. 33—36, p. 3, t. 1 (1846). Synops. 118 (1860); 2 ed. 130 (1876). HARTM. Sk. Fl. RABENH. Deutsch. kr. fl. ii, P. 3, 131 (1848). WILS. Bry. br. 56, t. 38 (1855). BERK. Handb. br. m. 287 (1863). DE NOT. Epil. Bri. ital. 657 (1869). HOBK. Syn. br. m. 38 (1873). JURATZ. Laubm. Oesterr.—ung. 73 (1882).

Blindia Stylostegium C. MUELL. Synops. i, 345 (1849).

Blindia cæspiticia LINDB. Musc. Scand. 25 (1879).

Autoicous; densely cæspitose, in dwarf rigid tufts; about ½ in. high, dull yellow-green above, fuscescent below, rigid dichotomous and fastigiate. Leaves crowded, erecto-patent, or slightly falcato-secund above, oblong, subulate, ending in a very short hyaline point, entire, thin-nerved; cells at base narrow linear-oblong, angular enlarged brown incrassate, upper narrow smaller flexuose. Perich. bracts much larger, sheathing. Capsule immersed, obovate-globose, truncate, gymnostomous, pachydermous, pale brown; calyp. covering only the lid which is orange, depressed, obliquely rostrate, and adnate to the columella.

Male infl. gemmaceous, at base of fertile branches; bracts concave, ovate, acuminate.

HAB.—Crevices of wet mountain rocks; rare. Fr. 7—9.
Summit of Ben Lawers (Hooker 1830)!!

2. BLINDIA ACUTA (*Huds.*) *Br. Sch.*

Dioicous; leaves oblongo-lanceolate, linear-subulate, acute. Capsule exserted, pyriform; with 16 lanceolate entire or perforated teeth. (T. XVII, F.)

SYN.—*Bryum pilosum, sphagni subulati facie* DILL. Hist. musc. 374, t. 47, f. 34 (1741) et herb.

Bryum verticillatum LIGHTF. Fl. Scot. ii, 733 (1777).

Bryum acutum HUDS. Fl. angl. 2 ed. 484 (1778). WITH. Bot. arr. br. veg. 3 ed. iii, 823 (1796). DICKS. Herb. sicc. fasc. 17, n. 20. HULL Br. fl. P. 2, 260 (1799). P. BEAUV. Prodr. 45 (1805).

Weissia acuta HEDW. Stirp. cr. iii, 85, t. 35 (1792); Sp. musc. 71 (1801). BRID. Musc. rec. II, P. I, 78 (1798); Sp. musc. I, 110 (1806); Mant. 47 (1819); Bry. univ. i, 362 (1826). SCHWAEG. Suppl. I, P. I, 69 (1811). ROEHL. Deutsch. fl. iii, 51 (1813); Ann. Wett. ges. iii, 112. WAHL. Fl. lapp. 322 (1812). HOOK. TAYL. Musc. br. 48, t. xv. (1818). GRAY Nat. arr. br. pl. i, 732 (1821). HOOK. Fl. Scot. P. 2, 131 (1821); Brit. fl. ii, 24 (1833). FUNCK Moost. 14, t. 9 (1821). HUEBEN. Musc. germ. 146 (1833). MACK. Fl. hib. P. 2, 16 (1836). DE NOT. Syll. musc. 230 (1838).

Weissia rupestris HEDW. Sp. musc. t. 14.

Grimmia rupincola WEB. MOHR Reise Schwed. t. 2, f. 3 a—d (1804).

Grimmia acuta SM. Fl. brit. iii, 1192 (1804); Eng. Bot. t. 1644. TURN. Musc. hib. 29 (1804). WEB. MOHR Bot. Tasch. 145 (1807). SCHKUHR D. kr. gew. P. II, 50, t. 26 (1811).

Weissia fastigiata NEES HSCH. Bry. germ. ii, t. 35, f. 31 (1831).

Blindia acuta BR. SCH. Bry. eur. f. 33—36, p. 3, t. 1 (1846). C. MUELL. Syn. i, 342 (1849). RABEN. Deutsch. Kr. fl. ii, s. 3, 133 (1848). WILS. Bry. brit 58, t. 15 (1855). SCHIMP. Syn. 119 (1860), et 2 ed. 131 (1876). BERK. Handb. br. m. 286, t. 24, f. 1 (1863). MILDE Bry. siles. 88 (1869). HOBK. Syn. br. m. 39 (1873). JURATZ. Laubm. Oesterr.—ung. 72 (1882).

Seligeria acuta DE NOT. Epil. bri. ital. 653 (1869).

Dioicous: laxly cæspitose, in compact fragile tufts 1—4 in. high, yellow-green above, olivaceous or black below; the young stem pale red. Leaves crowded, erecto-patent, the apical sometimes secund, oblongo-lanceolate, linear-subulate, acute, entire, convolute-concave; angular cells large, orange-brown; nerve thin, excurrent. Perich. bracts from a broad sheathing base, suddenly plicato-subulate. Caps. on a short purple seta, pachydermous, pyriform oval, erect, pale brown,

cyathiform and black when old; calyp. reaching middle of capsule; lid orange, depressed, with an oblique subulate beak; teeth of per. erect, lanceolate, entire or perforated here and there, or cleft at apex, purple, smooth.

Male pl. shorter, infl. terminal, gemmac. with ovate acuminate bracts.

HAB.—Crevices of alpine rocks, and among stones by mountain rills; frequent. Fr. 7.

In exposed places the plants become dwarfed, and the seta so short as scarcely to elevate the capsule above the leaves; tall plants are generally decumbent and denuded of leaves at the base.

10. DIDYMODON (HEDW.) WEB. MOHR.

(Bot. Tasch. 1807.)

Plants slender, cæspitose, dichotomous, interwoven with radicular tomentum; leaves secund, lanceolate setaceous, with a broad nerve; angular cells dilated. Caps. straight oblong or cylindric, on a cygneo-flexuose seta; calyp. cucullate, entire at base; per. arising below mouth of caps. of 16 teeth, cleft to base into two nearly equal, linear-subulate legs, remotely articulate, erect, connivent when moist.—Deriv. διδυμος twin, οδους a tooth.

The genus *Didymodon* was established by Hedwig in 1792 for *D. rigidulus*, to which in 1801 he added *D. homomallus;* the former is now referred to *Barbula*, the latter to *Ditrichum*. In 1807 Weber and Mohr placed under it the two species of *Swartzia*, *Ditrichum pusillum* and *glaucescens* and a new species *longirostrum* which Bridel had a year previously named *Dicranum denudatum*. It is clear this last remains the type of the genus, and cannot be set aside for the modern *Dicranodontium*, than which it is also far more appropriate, for the teeth are *not* like those of *Dicranum*, and by the peristome alone can it stand separate from the latter genus. Closely allied is the Mexican *Atractylocarpus* MITT. of which a third species is the *Metzleria alpina* SCHIMP. found in Switzerland and Austria.

DIDYMODON DENUDATUS (*Brid.*) *Lindb.*

Dioicous; leaves from an oblong base longly subulate, slightly denticulate above, with hyaline angular cells. Caps. on a cygneous seta, subcylindric, lid with a long straight beak. (T. XVII, G.)

SYN.—*Dicranum flexuosum* BRID. Musc. rec. II, P. I, 163 (1798). ROEHL. Moosg. deutsch. 329 (1800).

Dicranum denudatum BRID. Sp. musc. I, 184 (1806); Mant. 61 (1819). C. MUELL. Synops. i, 403 (1849). JENS. Bry. dan. 95 (1856).

Didymodon longirostrum WEB. MOHR Bot. Tasch. 155 et 463 (1807). ROEHL. Deutsch. fl. iii, 56 (1813). FICIN. Fl. dresd. ii, 43 (1823). BRID. Bry. univ. i, 512 (1826). DUBY Bot. gall. ii, 567 (1830). HUEBEN. Musc. germ. 279 (1833). DE NOT. Syll. musc. 196 (1838).

Cynodontium long. SCHWAEGR. Suppl. I, I, 111, t. 29 (1811). MART. Fl. cr. erl. 94 (1817).

Dicranodontium longirostre BR. SCH. Bry. eur. fasc. 41, p. 2, t. 1 (1848). RABENH. Deutsch. Kr. fl. ii, S. 3, 149 (1848). WILS. Bry. brit. 86, t. 39. (1855). SCHIMP. Synops. 96 (1860), et 2 ed. 99 (1876). BERK. Handb. br. m. 274 (1863). MILDE Bry. siles. 75 (1869). DE NOT. Ep. bri. ital. 636 (1869). HUSN. Mouss. nord-ouest 55 (1873). HOBK. Syn. br. m. 49 (1873). JURATZ. Laubm. oesterr.—ung. 52 (1882).

Trichostomum longirostre HARTM. Skand. fl.

Didymodon denudatus LINDB. Musc. scand. 25 (1879).

Dioicous; in soft tufts, 1—3 in. high, erect or ascending, almost naked at base, pale or glossy yellow-green above, interwoven with rufous tomentum. Leaves readily deciduous, falcato-secund, from a subvaginant base, longly subulate, involute-concave, serrate or entire at apex, smooth at back; basal auricles suddenly inflated, equal to all base of wing, hyaline and usually rufescent toward margin, upper cells small, quadrate; nerve broad flattened, half width of base, excurrent. Perich. bracts longly sheathing, suddenly subulate with the excurrent nerve, laxly areolate below; seta pale, flexuose. Capsule small, subcylindric, leptodermous, pale brown, nearly equal; lid straight, rostrate, long as capsule; peristome pale red. Male infl. terminal, gemmaceous.

HAB.—On turfy banks and rotten wood in subalpine districts. Fr. very rare. 8.

Cromagloun (*Taylor* 1841). O'Sullivan's cascade (*Hunt* 1867)! Stirrup wood, Mottram (*Whitehead* 1860)!! Highgreen wood, Heptonstall (*Nowell*)!! Hebden valley and Staley brushes (*Hunt* 1865)!! Bolton (*Dr. Wood*). Trefriew, Carnarvon (*Dr. Wood* 1863)! Bowness (*Hunt* 1871)! Trossachs (*Wilson* 1858)!! Campsie (*McKinlay*)! Ben Arthur (*Dr. Stirton* 1866)! Barmouth (*Whitehead* 1877)!! Skye, in fruit (*Prof. Lawson* 1872)!!

Var. *β.* **alpinus** (*Schimp.*)

Plants taller and more robust; leaves not deciduous, erect or subsecund rather rigid.

SYN.—*Campylopus alpinus* SCHIMP. Bry. eur. Suppl. I-II (1864). BRAITHW. Journ. Bot. 1870, p. 389. HOBK. Syn. br. m. 51 (1873).

Camp. pachyneuros MOLENDO Moos-stud. aus dem Alg. alp. 63 (1865).

Camp. intermedius WILS. MSS.

HAB.—Twll-Du near Llanberis (*Wilson*)! Arrochar, with fruit (*McKinlay*). Callander (*Stirton*). Glen Callater and Stronaclacher (*Hunt*)!! Ben More in Glen Dochart (*Schimper* 1865)! Summit of Ingleboro (*Hunt* 1867)!! Powerscourt, Lough Bray, Kelly's Glen, Cushendall and Kylemore (*Moore*)!! Cader Idris (*Whitehead* 1879)!! Ben Wyvis (*Howse* 1870)!

This very variable moss resembles *Ditrichum flexicaule*, from which it is easily separable by the different areolation of the leaf at base.

In Bot. Zeit. 1870, p. 392, Milde has an excellent paper "*ueber Dicranodontium*," in which he shows that *Camp. alpinus* must be referred as a variety to the present species, as Juratzka had already done in Hedwigia, 1867, p. 180, the rhombic and oval upper cells of a *Campylopus* being absent. He enumerates five other varieties, one of which *circinatum*, must be restored to specific rank, and placed, as Mitten has done, under *Dicranum uncinatum*.

The second species *Dic. aristatum* SCHIMP. must also be referred without the slightest doubt to *Dicranum asperulum* MITTEN, with fertile Indian plants of which ours agrees precisely in leaf-structure.

11. CAMPYLOPUS BRID.

Mantissa 71 (1819).

Mosses resembling *Dicranum* in habit. Leaves with a broad nerve of several strata of cells, furrowed or smooth at back; basal cells dilated, hyaline or brown at the excavated angles. Calyptra cucullate, fringed at base. Caps. on an arcuate or flexuose or rarely straight seta, equal, pachydermous, generally striated, deeply sulcate when dry. Annulus of 1—3 series of cells. Peristome dicranoid.—Inhabiting turfy ground and rocks. Der.—καμπυλος curved, πους a foot.

Nearly 200 species are referred to this genus, some of which are no doubt synonymous, and a great number are only known in a sterile state; more than one-third of them are natives of central America. C. Mueller and some other bryologists retain the genus as a section of *Dicranum*, yet it has a peculiar facies readily recognized after a little practice, by which we may with certainty separate the two. Several species produce slender flagelliform branches, by which they propagate, and very frequently the stems are matted together by an abundance of branched radicles produced from the axils or backs of the leaves. The leaves themselves are densely crowded, imbricated when dry, erecto-patent when moist, and frequently terminate in a white hair; above the base the marginal cells are extremely narrow, and they become wide and rectangular towards the nerve, the transverse walls being frequently incrassate, in the narrow part of the lamina they are much smaller, quadrate, rhombic or oval, and often crammed with chlorophyl; the structure of the nerve is best seen in transverse section, the back of it being often furrowed by the projection of alternate rows of cells, which sometimes even extend into lamellæ. The curious falling off of the leaves in several species of this genus and in the last is attributed by Lindberg to some change in the contents of the basal cells, akin to the fatty degeneration in animal tissues, the result being the arrest of circulation through those cells and their separation from the stem.

CLAVIS TO THE SPECIES.

Leaves concolorous.
- Leaves not auricled at base.
  - Nerve ⅓ width of leaf-base. — *pyriformis.*
  - Nerve more than ½ width of leaf-base.
    - Stems tomentose above.
      - Nerve ½ width of base; basal cells large, lax, hyaline. — *fragilis.*
      - Nerve ⅔ width; basal cells small and narrow. — *Schimperi.*
    - Stems not tomentose above, very short. — *subulatus.*
- Leaves auricled at base.
  - Stems not tomentose above, nerve above half width of base.
    - Leaves dense, nearly entire.
      - Leaves shortly and gradually subulate, margin inflexed from above base. — *Schwarzii.*
      - Leaves longly subulate by the margin being inflexed suddenly at ½ their length. — *Shawii.*
    - Leaves distant, serrate above. — *setifolius.*
  - Stems tomentose throughout, nerve one-third width of base.
    - Leaves long, suddenly subulate for ⅔ length of leaf. — *flexuosus.*
    - Leaves short, gradually narrowed into a subula half their length. — *paradoxus.*

Leaves with hyaline points.
- Point of leaf a hoary hair.
  - Leaves auricled at base; nerve ⅓ width. — *atrovirens.*
  - Leaves not auricled; nerve ⅔ width. — *introflexus.*
- Hyaline point very short; nerve ⅓ width of base. — *brævipilus.*

1. CAMPYLOPUS PYRIFORMIS (*Schultz*) *Brid.*

Dioicous; densely cæspitose, not tomentose above; leaves erecto-patent, lanceolate-subulate, longly setaceous, denticulate at point. Caps. oval, pale, lid conico-subulate, red. (T. XVII, I.)

SYN.—*Dicranum flexuosum* HEDW. Sp. musc. t. 38 (1801).

Dicranum flexuosum Var. SCHULTZ Fl. starg. 298 (1806).

Dicranum pyriforme SCHULTZ Suppl. Fl. starg. 73 (1819). FUNCK Moost. 31, t. 21 (1821). SPRENG. in L. Syst. veg. iv. 167 (1827). HUEBEN. Musc. germ. 268 (1833). MITT. Journ. Lin. soc. i, Suppl. 17 (1859).

Campylopus flexuosus BRID. Bry. univ. i, 469, p.p.

Campylopus pyriformis BRID. Bry. univ. i, 471 (1826). BRAITHW. in Journ. Bot. 1870, p. 393. HOBK. Syn. br. m. 54.

Camp. turfaceus BR. SCH. Bry. eur. fasc. 41, p. 4, t. 3 (1848). WILS. Bry. brit. 89, t. 40 (1855). SCHIMP. Synops. 98 (1860), et 2 ed. 103 (1876). BERK. Handb. br. m. 272 (1863). MILDE Bry. siles. 77 (1869). HUSN. Mouss. nord-ouest 58 (1873). JURATZ. Laubm. oesterr.—ung. 56 (1882).

Thysanomitrium pyriforme RABENH. Deutsch. Kr. fl. ii, S. 3, 149 (1848).

Dicranum turfaceum C. MUELL. Synops. 1, 399 (1849).

Dicr. pinetorum GRIFF. Not. pl. as. P. II, 419 (1849); Ic. pl. as. ii, T. 94, f. 3 (1849).

Dioicous; densely cæspitose, in large low olivaceous or bright green or tawny tufts; stems ½—1 in. high, erect, radiculose only at base. Leaves gradually longer to the coma, erecto-patent, lower lanceolate, median lanc. subulate, upper from an ovato-lanceolate base, suddenly setaceous, denticulate at point; nerve ⅓ width of base, sulcate at back, in section of 3 strata of cells, the two anterior lax, echlorophyllose; angular cells small, lax, inconspicuous, the rest small, quadrate, very minute above. Caps. on a pale flexuose cygneous pedicel, deflexed, elliptic-oblong, pale olive, becoming pale brown when empty; lid conico-subulate, red, darker at base, with a broad annulus; calyptra blackish at apex; teeth red at base, pale above, cleft to middle; perich. bracts convolute, sheathing, gradually subulate, laxly areolate at base.

Male plant dwarf; inner bracts from a broad base shortly acuminate.

HAB.—Heaths, moorlands and by sides of ditches; not uncommon. Fr. 12—5.

This may be easily confused with some forms of *C. fragilis*, but the leaves are more irregularly divergent, and with longer setaceous points, the lamina ends more abruptly above, and is not narrowed at the base, the whole dilated part being scarce ¼ length of leaf. The var. *Müller*i (*C. Müller*i JURATZKA), is only a form with the fringe of the calyptra imperfectly developed; Mr. Holt finds it at Delamere, Cheshire, as frequent as the ordinary state.

2. CAMPYLOPUS FRAGILIS (*Dicks.*) *Br. Sch.*

Dioicous; pale green, densely leafy above; leaves straight, narrowly lanceolate, very thin and pale at base. Caps. bent down among the leaves, oval olivaceous; lid pale red. (T. XVIII, A.)

SYN.—*Bryum fragile* DICKS. Pl. cr. brit. Fasc. III, 5 (1793). HOFFM. Deutsch. fl. ii, 38 (1796).

Dicranum flexuosum β. fragile TURN. Musc. hib. 74 (1804). SM. Fl. brit. iii, 1229 (1804), p.p. HUEB. Musc. germ. 267 (1833).

Dicran. densum SCHLEICH. Cr. helv. FUNCK Cr. gew. n. 634.

Campylopus penicillatus BRID. Mant. 73 (1819), Bry. univ. i, 478 et 815 (1826).

Camp. fragilis BR. SCH. Bry. eur. f. 41, p. 4, t. 2 (1848). SCHIMP. Synops. 97 (1860), et 2 ed. 102 (1876). Bry. eur. suppl. f. 1—2, p. 4, t. 1, f. 6 (1864). MILDE Bry. siles. 77 (1869). DE NOT. Epil. bri. it. 649 (1869). HOBK. Syn. br. m. 53 (1873). HUSN. Mouss. nord-ouest 57 (1873). JURATZ. Laubm. oesterr.—ung. 56 (1882).

Dicr. Funkii et D. Schleicheri C. MUELL. Synops. i, 392 (1849).

Campyl. densus BR. SCH. op. c. 6, t. 5. WILS. Bry. br. 88, t. 40 (1855). BERK. Handb. br. m. 272 (1863).

Thysanomitrium flexuosum β. saxicola RABENH. Deutsch. Kr. fl. ii, s. 3, 149 (1848).

Dioicous; densely cæspitose, ½—2 in. high, pale or yellow-green above, pale brown with rufous tomentum at base; innovations producing at apex fragile fasciculate branches with long narrow leaves. Leaves very dense, erecto-patent, straight, fragile deciduous, very thin and whitish at base, with a silky gloss, narrowly lanceolate, shortly setaceous, denticulate towards point; nerve lightly sulcate at back, of 3 strata of cells, the two anterior large and hyaline; cells at base lax and rectangular, above the marginal are very narrow and elongated, the rest subquadrate, upper oblong elliptic. Caps. bent down among the comal leaves by the cygneous seta, oval subpyriforum, lightly sulcate, olivaceous; calyp. sparingly fringed; lid conico subulate, pale red, oblique; annulus broad. Male pl. resembling that of *C. pyriformis*.

HAB.—Sandstone rocks and turfy soil in subalpine districts. Fr. 12—4.

Bantry (*Miss Hutchins* 1808)! Muckruss, Glengariff and Howth (*Hunt* 1864)! Alderley Edge and Frodsham, Cheshire (*Wilson*)! Todmorden (*Nowell* 1851)!! Ardingley (*Mitten*)! Trefriew (*Wood* 1863)! Mt. Edgcombe (*Holmes* 1867)! Ben Lomond (*Stirton* 1866)! Ben Ledi (*Braithwaite* 1865)!! Glen Prosen (*Fergusson* 1868)!! Tarbet, Gairloch and Loch Goil head (*Hunt* 1866)!! Cwm Bychan, Harlech (*Whitehead* 1878)! Kinder scout, Derby (*Whitehead* 1881)!! Verwood, Dorset (*Rev. H. Wood*)! Arncliff wood, Whitby (*Rev. J. F. Crouch* 1859)!

Plants more robust and leafy than the last, and with fine branched pale radicles on the stem, the expanded lamina narrower at base, ⅓ or ½ length of leaf, and gradually narrowed in the upper part with coarser areolation. Considerable variation in height and density is met with in this species but no definite line can be drawn between the two forms *densus* and *fragilis*.

3. CAMPYLOPUS SCHIMPERI *Milde.*

Dioicous; in dense tufts interwoven with rufous tomentum; leaves erect, straight, lanceolate-subulate, subtubulose, not auricled, the point with a few small teeth; nerve ⅔ width of base; basal cells lax, rectangular. (T. XVIII, C.)

SYN.—*Campylopus Schimperi* MILDE Bot. Zeit. 1864, Beil. p. 13. Hedwigia 1865, n. 2. DE NOT. Epil. bri. ital. 650 (1869). BRAITHW. Journ. Bot. 1870, p. 392, T. 111, fig. 3. HOBK. Syn. br. m. 54 (1873). SCHIMP. Synops. 2 ed. 107 (1876). JURATZ. Laubm. oesterr.—ung. 55 (1882).

Camp. compactus SCHIMP. in lit.

Dioicous; in very dense compact tufts interwoven with rufous tomentum, fastigiate, 1—3 in. high. Stems slender, cuspidate, light silky green above, fuscous below, dichotomous, with alternate innovations which are easily detached. Leaves appressed when dry, erecto-patent, straight, rigid, narrowly lanceolate-subulate, with a few small teeth at extreme apex, channelled in the lower part, becoming tubulose above from the incurved wings; nerve very broad, $\frac{2}{3}$ width of base, of 3—4 strata of cells, anterior lax and hyaline, posterior turgid and prominent; cells at extreme base brown and vesicular, above hyaline, very narrow at margin, elongato-rectangular towards nerve, the upper small and elliptic. Perich. bracts sheathing, suddenly narrowed into a long subula; caps. pale, ovate, striate, annulus broad, lid half length of caps. beaked, peristome small, the teeth cleft to middle; spores large.

HAB.—Highland mountains, on the ground and wet rocks; not common. Fr. 8.

Ben Challum (*McKinlay* 1863)! Ben Lawers (*Braithwaite* 1865)!! Ben Ledi and Ben Lomond (*Stirton* 1865)!! Bressay, Shetland (*Shaw* 1864)! The Ptarmigan mtn. (*Holt* 1880)!!

A pretty species, readily known by its very compact tufts, closely interwoven with fine branched radicles, which principally arise from the cells at back of the nerve. The fruit has only been found by Breidler on the Venediger near Zell-am-see.

4. CAMPYLOPUS SUBULATUS *Schimp.*

Dioicous; dwarf, densely gregarious, eradiculose; leaves short erect, lanceolate-subulate, nearly entire at apex, nerve half width of base, of 4 cell-layers. (T. XVIII, B.)

SYN.—*Campylopus subulatus* SCHIMP. in litt. ad Milde. MILDE in RABENH. Bryoth. n. 451 (Jan. 1862); Bot. Zeit. 1862, p. 460. LINDB. Musc. scand. 25 (1879).

Camp. brevifolius SCHIMP. Bry. eur. suppl. fasc. 1—2 (1864); Synops. 2 ed. 106 (1876). DE NOT. Epil. briol. ital. 650 (1869). MILDE Bry. siles. 78 (1869). BRAITHW. in Journ. Bot. 1870, p. 393. HOBK. Syn. br. m. 55 (1873). HUSN. Mouss. nord-ouest. 58 (1873). JURATZ. Laubm. oesterr.—ung. 55 (1882).

Orthopus brevifolius WULFSB. in Christian. Vid.-selsk. forh. 1875, p. 351.

Dioicous; densely gregarious, yellow green above, fuscescent below, stem $\frac{1}{2}$ in. high, not radiculose, simple or dichotomous, with caducous ramuli. Leaves enlarging upward, erect short rigid, lanceolate-subulate, deeply concave, not auricled, entire or with a few teeth at extreme apex, which is also sometimes hyaline; nerve very broad, ending with the apex, of 4 strata of cells, the two anterior larger and empty, two posterior smaller, the innermost of these least and chlorophyllose; cells at base lax, thin, very narrow at margin, rectangular toward nerve, upper small rhombic or straight. Seta straight.

HAB.—Dry sandy or gravelly banks by roadsides; rare.

By the bridge on the road between the Hunting tower and Cromagloun, Killarney (*Schimper* and *Wilson* June 1865)! Near Fern, Brechin (*Fergusson* 1876)!

This little plant is a miniature of *C. Schwarzii* from which it can only be distinguished by the auricled leaves in the latter species, to which indeed McKinlay's Perthshire specimens referred here, truly belong. Wulfsberg found the plant with young fruit Sept. 1874 at Skœlnes in the island of Varaldsoe, Norway, having a straight seta, and on this character alone, founded the genus *Orthopus;* this cannot be maintained, as several exotic species have a straight seta, and the point is too trivial for generic distinction.

5. CAMPYLOPUS SCHWARZII *Schimp.*

Dioicous; densely tufted, scarcely radiculose; leaves erecto-patent, lanceolate-subulate, subtubulose, auricled at base, the point with a few teeth; nerve ⅔ width of base. (T. XVIII, D.)

Syn.—*Campylopus Schwarzii* Schimp. Bry. eur. suppl. fasc. 1—2 (1864); Synops. 2 ed. 105 (1876). De Not. Epil. bri. ital. 651 (1869). Braithw. in Journ. Bot. 1870, p. 391. Lindb. Musc. scand. 25 (1879). Juratz. Laubm. oesterr.—ung. 58 (1882).

Camp. auriculatus Wils. MSS.

Dioicous; in dense soft silky yellowish-green tufts, fuscous below. Stems 2—3 in. high, slender, repeatedly dichotomous, erect, sparingly radiculose. Leaves erecto-patent, straight or slightly secund above, lanceolate-subulate, concave below, subtubular above, with a few small teeth at apex; nerve ⅔ width of base, of 3—4 strata of cells, anterior lax, hyaline, the rest small, chlorophyllose, often producing fine reddish radicles from the back; wings dilated at basal angles into auricles of lax thin cells, partly brown, partly hyaline, the cells above small, narrow and elongated, becoming subquadrate upward. Female infl. aggregated at top of stem, bracts dilated at base, suddenly subulate.

Hab.—Alpine rocks. Not common.

Nephin mountain, Mayo (*Moore* 1852)!! Connor hill, Dingle and Carrantuohil mtn. Kerry (*Moore* 1857)!! Brandon mtn. (*Schimper* 1865)! Gap of Dunloe and Mangerton, Killarney (*Hunt* 1872)! Muckish mtn., Donegal (*Moore* 1866). Ben Ledi, Ben Voirlich, Balquidder, Arrochar and Dunoon (*McKinlay* 1863)! Glencoe and Kinlochewe, Ross (*Hunt* 1866)!! Borrowdale, Cumberland (*Hunt* 1871)!! Head of Clova (*Fergusson*)!! Hills behind Callander (*Stirton* 1864). Inverness, Sutherland and Caithness.

This moss varies considerably in size and colour, and is always more slender and attenuated at the points than the next species, with the leaves more distantly placed on the stem.

6. CAMPYLOPUS SHAWII *Wils.*

Dioicous; in dense tufts, with few radicles; leaves erecto-patent, very dense, straight or secund above, lanceolate-subulate, with a few teeth at point; nerve ⅔ width of base. (T. XIX, A.)

Syn.—*Campylopus Shawii* Wils. MSS. Braithw. in Journ. Bot. 1870, p. 389, T. 111, f. 1. Hobk. Syn. br. m. 51 (1873). Schimp. Syn. 2 ed. 851 (1876).

Dioicous; densely tufted, fastigiate, yellowish green above, brown below, 1—3 in. high; stems straight, sparingly dichotomous, with fine brown radicles at base of leaves. Leaves densely crowded, erecto-patent straight rigid, from a somewhat contracted auricled base, lanceolate, longly subulate, contracted below the middle and involute in a semitubular subula, apex acute with a few minute teeth; nerve very broad, $\frac{2}{3}$—$\frac{3}{4}$ width of base and occupying all upper part, smooth at back, of 3 strata of cells, anterior large lax and hyaline, the other two small and chlorophyllose; angular cells very lax, hyaline or partly fuscous, above rectangular, becoming rhomboido-elliptic and oval upward.

HAB.—Bogs near Loch Maddy, N. Uist (*Shaw* 1866), also in S. Uist and other Hebridean Islands.

Var. *β.* **hamatus** *Schimp.* Synops. l.c.

Stems shorter, more robust; leaves very densely crowded, broader, hamato-secund.

In N. Uist with the type.

This fine plant approaches very close to *C. Schwarzii*, from which it can best be distinguished by the tomentose stem and suddenly inflexed margin of the leaves; the hoary point of *C. atrovirens* separates it from that species.

7. CAMPYLOPUS FLEXUOSUS (*L.*) *Brid.*

Dioicous; in dense glossy yellow-green tufts, interwoven with rufous tomentum; leaves lanceolate-subulate, denticulate at point, angular cells lax, fuscous, upper minute, elliptic, incrassate. Caps. ovato-elliptic, pale, sulcate; lid conico-subulate, concolorous. (T. XVIII, F.)

SYN.—*Muscus trichoides pediculo contorto, D. Sherardi.* DOODY, RAY Syn. St. brit. 2 ed. app. 339 (1696).

Bryum trichoides, capitulis erectis, pediculis intortis tenuibus virentibus. DILL. Cat. Giss. 225 (1719); in RAY Syn. 3 ed. 97 (1724).

Bryum pilosum molle, setis intortis. DILL. Hist. musc. 373, t. 47, f. 33 A—E (1741) p.p.

Bryum flexuosum L. Sp. pl. 1118 (1753); Syst. nat. ii, 702; Syst. veg. 948. HUDS. Fl. angl. 407 (1762). NECK. Meth. musc. 205 (1771). WITH. Bot. arr. br. veg. 674 (1776). LIGHTF. Fl. scot. ii, 725 (1777). ROTH Tent. fl. germ. 473 (1788). HULL Br. fl. P. II, 264 (1799). HOFFM. Deutsch. fl. ii, 38 (1796).

Dicranum flexuosum BRID. Musc. rec. II, P. I, 163 (1792) excl. syn. Sp. musc. I, 208 (1806); ROTH Fl. germ. ii, P. I, 162 (1789). SWARTZ Musc. suec. 34 (1799). ROEHL. Moosg. deutsch. 339 (1800); Deutsch. fl. iii, 69. SMITH Fl. brit. iii, 1229 (1804); Eng. Bot. t. 1491. TURN. Musc. hib. 74, p.p. t. 5, f. 2a (1804). SCHULTZ Fl. starg. 298 (1806). WEB. MOHR Bot. Tasch. 169 (1807). SCHWAEG. Suppl. I, P. I, 189 (1811). VOIT Musc. herb. 44 (1812). HOOK. TAYL. Musc. br. 53, t. 16 (1818), p.p. FUNCK Moost. 31, t. 21 (1821). GRAY Nat. arr. br. pl. i, 735 (1821). HOOK. Fl. scot. P. 2, 132 (1821); Br. Fl. ii, 38 (1833). HUEBEN. Musc. germ. 267 (1833). MACK. Fl. hib. P. 2, 22 (1836). C. MUELL. Syn. i, 400 (1849). JENS. Bry. dan, 94 (1856).

Campylopus flex. BRID. Mant. 71 (1819), Bry. un. i, 469 (1826), p.p. BR. SCH. Bry. eur. fasc. 41, t. 1 (1847). WILS. Bry. brit. 90, t. 16 (1855). SCHIMP. Synops. 97 (1860), et 2 ed. 102 (1876). BERK. Handb. br. m. 273, t. 23, f. 4 (1863). MILDE Bry. sil. 76 (1869). HOBK. Syn. br. m. 52 (1873). HUSN. Mous. nord-ouest 57 (1873). JURATZ. Laubm. oesterr.—ung. 54 (1882).

Thysanomitrium flex. ARN. Disp. mouss. 33 (1825), excl. var. RABENH. Deutsch. kr. fl. ii, P. 3, 149 (1848).

Dioicous; in dense rigid tufts, 1—3 in. high, glossy yellow-green above, reddish below; stems covered with rufous tomentum arising from back of leaf at base; ramuli with small leaves, caducous. Leaves crowded, erecto-patent or secund above, solid, lanceolate-subulate, channelled, serrulate at apex, excavate at basal angles; nerve broad, nearly ½ width of leaf-base, occupying all the denticulate apex, furrowed at back, in section of 3 strata of nearly equal cells, the two anterior lax and empty; angular cells lax vesicular brown, the rest subquadrate pellucid, upper minute, elliptic, incrassate. Perich. bracts with a long convolute sheathing base, suddenly subulate, denticulate at apex; capsules often aggregated, seta pale brown, cygneous, finally erect, caps. ovate rather gibbous, pachydermous, pale brown, slightly furrowed; annulus broad, lid conico-subulate, oblique, concolorous; teeth red, cleft to middle, with slender hyaline legs. Male plant short, inflor. often aggregated at apex, bracts broad, acuminate.

HAB.—On turfy ground and moist sandstone rocks. Fr. 11—2.

Var. *β.* **paludosus** *Schimp.*

Taller and more slender, with fewer radicles; leaves more distant, more elongated, with a narrower nerve.

SYN.—*Dicranum palustre* LA PYL. BRID. Bry. univ. i, 814.
Campylopus paradoxus p.p. SCHIMP. Synops. 2 ed. 108.

HAB.—Boggy heaths in subalpine districts.

Barmouth (*Dr. Wood* 1875)! in Herb. Schimp. as C. *paradoxus*. Foot of Cader Idris (*Percival* 1876)!! Near Llyn Ogwen (*Boswell* 1874)!! Loch Maree (*Boswell* 1875)!!

Much more robust than the ordinary form and 3—4 in. high, with the bases of leaves often tinted with purple.

8. CAMPYLOPUS PARADOXUS *Wils.*

Dioicous; in loose dull-green tufts with a few rufous radicles. Leaves lanceolate, shortly subulate, rather obtuse, the nerve lost in the apex; angular cells fuscous, becoming smaller rhomboidal and quadrate above. (T. XVIII, G.)

SYN.—*Campylopus paradoxus* WILS. MSS. HARDY in Berwick. Nat. Club Hist. 1868, p. 448. BRAITHW. in Journ. Bot. 1870, p. 390, t. 111, f. 2. HOBK. Syn. br. m. 52 (1873). SCHIMP. Synops. 2 ed. 108 (1876).

Dioicous; densely tufted, 1—2 in. high, dull deep green above, pale fuscous below; stems fastigiate, dichotomous or with short lateral ramuli, and only a few rufous sparingly branched radicles. Leaves erecto-appressed when dry, erecto-patent when moist, lowest ovate obtuse, becoming lanceolate above, the uppermost shortly lanceolate-subulate, concave and subtubular in upper part, apex with a few irregular teeth; nerve ⅓ width of base, vanishing at apex, composed of

3 strata of cells, two anterior larger and empty, posterior small and chlorophyllose; basal cells rectangular hyaline, becoming fuscous when old, above these smaller and quadrate, becoming incrassate and irregularly rhomboidal and oval toward apex.

HAB.—Peaty soil in subalpine districts; rare.

With *Dicranella heteromalla* in Trickley planting, top of Whiteside hill, Wooler, Northumberland (*Hardy and Boyd* 1868)!! Ulpha bog near Levens, Westmoreland (*Barnes* 1868)!! Glencoe (*Prof. Barker* 1870). Morwell rocks near Tavistock, Devon (*Holmes* 1873)!! Rumbold's moor, Ilkley, Yorks. (*Wesley* 1878)!! Summit of Kinder Scout, Derby (*Whitehead* 1881)!!

Close as this species stands to *C flexuosus*, it has so peculiar an aspect, that we prefer to keep them separate, basing the distinction on the short straight leaves of *C. paradoxus*, with the lamina distinct to the apex. The original specimens are scarcely an inch in height, and amongst the stems are some with terminal rosettes of short ovate leaves more laxly areolate, these are probably abortive males; Whitehead's specimens are 2½ in. high, and Wesley's nearly as tall. It is probable that it may eventually have to sink to a Var. of *C. flexuosus*.

9. CAMPYLOPUS SETIFOLIUS *Wils.*

Dioicous; tall and slender, without radicles; leaves long, lax, lanceolate-subulate, serrate, with large inflated auricles; caps. ovato-pyriform, lid conico-rostellate. (T. XVIII, E.)

SYN.—*Campylopus setifolius* WILS. Bry. br. 89, t. 40 (1855). BERK. Handb. br. m. 272 (1863). SCHIMP. Bry. eur. suppl. fasc. 3—4, t. 6 (1866). Syn. musc. 2 ed. 106 (1876). BRAITHW. in Journ. Bot. 1870, p. 391. HOBK. Syn. br. m. 53 (1873).

Dioicous; laxly tufted, glossy yellowish-green above, dark brown or blackish below, stems slender 3—10 in. high, dichotomous, with a few radicles only at base. Leaves rather distant, longly lanceolate-subulate, with large inflated auricles, very concave and subtubulose, serrated toward apex, subula formed of the excurrent nerve, hispid at back; basal cells hexagono-rectang. empty, upper rhombic, chlorophyllose; nerve half width of base, of 3 strata of cells, outer minute chlorophyllose, middle equal hyaline, inner twice as large hyaline. Fruit aggregated, about 4 together, perich. bracts oblong, convolute sheathing, suddenly narrowed into a setaceous subula; seta short flexuose, reddish brown, cygneous when moist; caps. suberect, pale brown, ovato-pyriform, becoming cylindraceous when old, sulcate, annulus very broad, breaking up, lid conico-rostellate, half length of capsule, per. erect, dark reddish-brown, cleft above half way, the legs yellow, spores pale.

Male plant slender, infl. 3—4 in a capitulum, gemmiform, outer bracts ovate, subulate, inner ovate-oblong, muticous, nerveless.

HAB.—Rocks among grass and heath; rare. Fr. 6.

Carrig mountain, Dunkerron (*Taylor* 1836). Powerscourt and near Seven Churches, Wicklow (*Moore* 1864)!! Cromaglown in fruit, intermixed with *C. atrovirens* and *C.*

flexuosus in fruit (*Capt. Hutton* 1865)! Eagle's nest, Pass of Dunloe and Kenmare Road, Killarney (*Carrington and Hunt* 1861)!! Kylemore Castle, Connemara (*Moore* 1870)!! Sligichan, Skye (*Hunt* 1863)!! Island of Lewis, Hebrides (*Moore* 1868)! Cwm Bychan near Harlech, in fruit (*George* 1878).

The fertile plant is shorter and more densely leafy than the sterile or male, and the species is easily recognized by the large inflated auricles, and serrated hispid subula.

10. CAMPYLOPUS ATROVIRENS *De Not.*

Dioicous; in dense dark green cushions; leaves lanceolate-subulate, auricled, ending in rough white points. (T. XIX, B.)

SYN.—*Dicranum flexuosum* γ. *piliferum* TURN. Musc. hib. 74, p.p. t. 5, f. 2 b,c. (1804)

Dicr. flexuosum β. *nigro-viride* HOOK. TAY. Musc. brit. 2 ed. 94, p.p. (1827).

Campylopus longipilus BRID. Bry. univ. i, 477 (1826) p.p. WILS. Bry. brit. 90, t. 40 (1855). BERK. Handb. br. m. 273 (1863). SCHIMP. Bry. eur. suppl. fasc. 1—2, t. 3 (1864); Synops. 2 ed. 103 (1876). JURATZ. Laubm. oesterr.—ung. 58 (1882).

Campylopus atrovirens DE NOT. Syll. musc. 221 (1838); Epil. bri. ital. 648 (1869). BR. SCHIMP. Bry. eur. fasc. 41, p. 6, t. 4 (1847), p.p. Synops. 98 (1860). SPRUCE in Ann. mag. Nat. hist. 2 ser. iii, 483 (1849). BRAITHW. in Journ. Bot. 1870, p. 387. HOBK. Syn. br. m. 50 (1873). HUSN. Mouss. nord-ouest 59 (1873).

Dicranum atrovirens C. MUELL. Syn. i, 414 (1849).

Dioicous; in dense silky cushions, lurid green or yellow-green above, black below; stems slender, 1—5 in. high, repeatedly dichotomous, dense-leaved, sparingly radiculose. Leaves gradually larger towards apex, erecto-patent, lanceolate, canaliculate-subulate, straight; nerve dilated, ⅓ width of base, sulcate at back, excurrent in a long hoary denticulate arista, in section of 4 strata of cells, the anterior and posterior rather larger than the two median layers; basal cells lax subrectangular, those of auricles vesicular lax brown, upper oblong and vermicular.

HAB.—Wet rocks and peaty ground on all our mountains; common. Near Penzance (*Curnow*)!!

Var. β. **falcatus** *Braithw.*

Stem short, more robust; leaves dense, broader, falcato-secund, circinate, very concave.

HAB.—Connemara (*Prof. Barker* 1868)!!

A form parallel to the variety of *C. Shawii*. The comal leaves of the ordinary state are frequently more or less secund, and slender flagelliform ramuli are also common. When the fragile hair points are lost, it is best to examine the young apical leaves, on which they are usually retained, otherwise there might be a difficulty in the determination of the species.

11. CAMPYLOPUS INTROFLEXUS (*Hedw.*) *Brid.*

Dioicous; olivaceous green, rigid; leaves not auricled, lanceolate subulate, terminating in a spinulose hoary point, basal cells hyaline; capsules aggregated, rugulose at base. (T. XIX, C.)

SYN.—*Dicranum introflexum* HEDW. Sp. musc. 147, t. 29 (1801). SCHWAEG. Suppl. I, P. I, 190 (1811). C. MUELL. Synops. i, 405 (1849).

Dicr. flexuosum γ. *piliferum* TURN. Musc. hib. p.p.

Dicr. capitiflorum P. BEAUV. Prodr. 53 (1805).

Campylopus introflexus BRID. Mant. 72 (1819); Bry. univ. i, 472. MITT. Journ. Lin. soc. xii, 84 (1869). BRAITHW. in Journ. Bot. 1870, p. 388. HOBK. Syn. br. m. 50 (1873).

Camp. pilifer BRID. Mant. 72 (1819).

Camp. longipilus BRID. Bry. un. i, 477, p.p. DE NOT. Syll. musc. 221 (1838). WILS. Bry. br. p.p. SCHIMP. Bry. eur. fasc. 41, t. 5, et Synops. 99, p.p.

Camp. polytrichoides DE NOT. Syll. musc. 222 (1838); Epil. bri. ital. 645 (1869). BERK. Handb. br. m. 273 (1863). HUSN. Mouss. nord-ouest 58 (1873). SCHIMP. Bry. eur. suppl. fasc. 1—2, t. 4 (1864), Synops. 2 ed. 104 (1876). JURATZ. Laubm. oesterr.—ung. 57 (1882).

Dicran. longipilum C. MUELL. Synops. i, 411 (1849).

Dicran. ericetorum MITT. Journ. Lin. soc. i, suppl. 20 (1859).

Dioicous; in crowded gregarious tufts, olive green above, reddish brown below, not unfrequently scorched at tips, somewhat glossy; stems 1—2 in. high, rigid, erect, dichotomous or fasciculate, tomentose with scattered radicles. Leaves erecto-patent, subimbricate when dry, lanceolate-subulate, channelled, uppermost broader, the margin inflexed and semitubular toward apex; nerve about $\frac{2}{3}$ width of base, lamelligerous at back, ending in a diaphanous strongly spinuloso-denticulate hair-point, below of 4 strata of cells, the anterior one larger and empty; the rest chlorophyllose; basal cells hyaline, hexagono-rectangular, passing obliquely toward margin as they ascend, angular cells few large brown, above small, chlorophyllose, obliquely rhomboid-oval. Perich. bracts convolute, oblong, subulate at apex with the narrow excurrent nerve, cells thin elongated pellucid; capsules aggregated, seta short, flexuose, pale brown; capsule oval, rather unequal, olivaceous, smooth, transversely rugulose and darker at base, lid oblique rostellate, fuscous; peristome orange red.

Male plant short, simple, the inflorescence in a capitulum, inner bracts colored, broad, convolute, with short points, nerve obsolete.

HAB.—Heaths, stony ground and rocks; not common.

Kymyal cliff, Tregarnow cliff, and Trungle moor, Cornwall (*Curnow* 1861)!! Cromaglown, Killarney (*Carrington* 1861)! Glengariff (*Hunt* 1864)!! Barmouth (*Whitehead* 1877)!! Jersey (*Holmes* 1873)!!

The discovery of the fruit of this plant near Oporto by Mr. Isaac Newton in 1879, confirms the accuracy of its reference to the tropical *C. introflexus*, the only difference we find being that in the European forms the arista is straight, but in the southern it is generally reflexed at an angle from the lamina; the chief peculiarity of the species is seen in the male plants, in which the leaves on the innovations are quite short and lax, gradually becoming more elongated and crowded to the coma, and thus strongly resembling a *Polytrichum*, e.g., *P. piliferum*.

12. CAMPYLOPUS BREVIPILUS *Br. Sch.*

Dioicous; densely tufted, the stems almost free from radicles, with fasciculate-leaved innovations; leaves narrowly lanceolate-subulate, the

point denticulate, hyaline, basal cells quadrate, hyaline, upper rhomboidal, flexuose. (T. XIX, D.)

SYN.—*Campylopus brevipilus* BR. SCH. Bry. eur. fasc. 41, p. 7, t. 4 (1847), et Suppl. fasc. 1—2, t. 2, f. 1—2 (1864). WILS. Bry. br. 91, t. 40 (1855). JENS. Bry. dan. 95 (1856). SCHIMP. Syn. 100 (1860), 2 ed. 106 (1876). BERK. Handb. br. m. 274 (1863). DE NOT. Epil. bri. ital. 647 (1869). MILDE Bry. siles. 78 (1869). HOBK. Syn. br. m. 50 (1873). HUSN. Mouss. nord-ouest 58 (1873).

Dicranum brevipilum C. MUELL. Syn. i. 412 (1849).

Camp. decipiens et *Molkenboeri* VAN DER SANDE LAC.

Dioicous; in dense tufts cohering only at base, glossy yellow-green above, fuscescent below; stems slender, fragile, 1—3 in. high, with scarcely any radicles, fasciculate-leaved. Leaves lanceolate below, becoming lanceolate-subulate above, and forming a coma, tipped with a short denticulate hyaline point, the margin recurved above the middle; nerve ⅓ width of base, in section of 3 strata of narrow cells, the central larger and hyaline, back of apex roughish; auricles generally slightly developed, basal cells rectangular, hyaline or partly fuscous, upper narrow rhomboidal, flexuose, marginal very narrow. Bracts of female infl. broad, sheathing, the margin subrevolute, nerve narrow.

HAB.—Moist heaths; not rare.

Prestwick Carr, Northumb. (*Thornhill* 1813)! Clonmel and Killarney (*Carrington* 1860) Skipwith common, York and Oakmere (*Wilson* 1863)!! Glengariff and Arran (*Hunt* 1864)!! Trungle moor, Penzance (*Curnow* 1865)!! Pilmoor (*Baker* 1867). Trowlsworthy bog, Devon (*Holmes*). Bloxworth, Dorset (*Rev. H. Wood*). Pressridge warren, Sussex and Matley, New Forest (*Davies*)!! Howth and Kylemore (*D. Orr*). Bressay, Shetland (*McKinlay* 1864). North Uist (*Shaw* 1866)! Glen Prosen (*Fergusson*). Groudale, I. of Man (*Holt* 1881)!!

This species differs both in habit and areolation from all the others, the upper cells having a distinct sigmoid curve, and the rough back of the leaf near the apex must not be overlooked. The hoary point to the leaf is very variable and sometimes is reduced to 2—3 cells or may be quite wanting.

12. DICRANOWEISSIA LINDB.

(Oefvers. K. vet. akad. foerh. 1864, p. 230.)

Plants tufted, fastigiate; leaves lanceolate, curled when dry, smooth, with distinct basal angular cells. Perichætium distinct, sheathing; capsule erect, smooth, calyptra cucullate, teeth of per. erect, lanceolate, with 10 or 12 striate articulations, trabeculate internally, cleft at apex or undivided. Der.—A compound of the two genera.

This is wisely separated from the old genus *Weissia*, as it is clear its affinities are much closer to *Dicranum*, of which it may perhaps be regarded as a section.

CLAVIS TO THE SPECIES.

Capsule elongate-oval, annulate; leaves lanceolate, margins reflexed.	*cirrata.*
Capsule ovate, exannulate; leaves lanceolate-subulate, margins plane.	*crispula.*

1. DICRANOWEISSIA CIRRATA (*L.*) *Lindb.*

Autoicous; laxly pulvinate, dichotomous; leaves lanceolate, rather obtuse with revolute margins, angular cells indistinct; capsule subcylindric, annulate. (T. XIX, F.)

SYN.—*Bryum trichoides exile, erectis capitulis in pediculis longioribus rubris* DILL. Cat. Giss. 224 (1719), et in RAY Syn. 3 ed. 97, n. 25 (1724).

Bryum cirratum et stellatum, tenuioribus foliis DILL. Hist. musc. 379, t. 48, f. 42 (1741).

Mnium cirratum L. Sp. pl. 1111 (1753); Syst. Veg. 946. OEDER Fl. dan. t. 538, f. 4 (1770). POLL. Pl. palat. n. 986, f. 9 (1777). WITH. Bot. arr. br. veg. ii, 666 (1776). HULL Br. fl. P. II, 250 (1799).

Bryum cirr. HUDS. Fl. angl. 409 (1762); NECK. Meth. musc. 213 (1771). LIGHTF. Fl. scot. ii, 728 (1776). HOFFM. Deutsch. fl. ii, 54 (1796). ABBOT Fl. Bedf. 238 (1798).

Hypnum cirr. WEISS Cr. Gott. 207 (1770).

Leersia cirr. WILLD. Pr. fl. berol. n. 902 (1787). ROTH Tent. Fl. germ i, 455 (1788).

Dicranum cirr. TIMM Fl. megap. n. 783 (1788).

Gymnostomum cirr. SCHRANK Baiers. Fl. ii, 436 (1789).

Afzelia cirr. EHRH. Pl. crypt. n. 232 (1790).

Encalypta cirr. SWARTZ Musc. suec. 25 (1799).

Weissia Dicksoni WILLD. op. c. n. 907. ROTH op. c. 456. HOFFM. op. c. 32. BRID. Musc. rec. II, P. I, 72 (1798).

Grimmia Dicks. ROTH op. c. iii, P. I, 143 (1793). SM. Fl. brit. 1188 (1804); Eng. bot. t. 1420. TURN. Musc. hib. 27 (1804).

Barbula cirr. BRID. op. c. 203. ROEHL. Moosg. deutsch. 230 (1800). P. BEAUV. Prodr. 92 (1805).

Grimmia cirr. SCHRAD. Journ. bot. 1799, II, 58. WEB. MOHR Bot. Tasch. 134 (1807). SCHKUHR Deutsch. Kr. gew. P. II, 54, t. 27 (1810). SM. Comp. fl. brit. 181 (1825).

Weissia cirr. HEDW. Sp. musc. 69, t. 12, f. 7—12 (1801). BRID. Sp. musc. I, 109 (1806); Mant. 41 (1819); Bry univ. i, 343 (1826). SCHWAEG. Suppl. I, P. I, 75 (1811). WAHLENB. Fl. lap. 303 (1812); Fl. carp. 340 (1814). ROEHL. Deutsch. fl. iii, 49 (1813); Ann. wett. ges. iii, 104. MART. Fl. cr. erl. 111 (1817). HOOK. TAYL. Musc. br. 46, t. 15 (1818). SCHULTZ Fl. starg. suppl. 67 (1819). FUNCK Moost. 15, t. 10 (1821). GRAY Nat. arr. br. pl. i, 731 (1821). HOOK. Fl. scot. P. II, 130 (1821); Br. Fl. ii, 21 (1833). NEES HORNSCH. Bry. germ. ii, P. II, 61, t. 29, f. 14 (1831). HUEBEN. musc. germ. 127 (1833). MACK. Fl. hib. P. 2, p. 14 (1836). DE NOT. Syll. 232 (1838); Epil. bri. ital. 596 (1869). BR. SCH. Bry. eur. fasc. 33—36 p. 9, t. 6 (1846). WILS. Bry. br. 47, t. 15 (1855). RABENH. Deutsch. Kr. fl. ii, S. 3, 127 (1848). JENS. Bry. dan. 120 (1856). SCHIMP. Synops. 56 (1860). BERK. Handb. br. m. 292 (1863). HOBK. Syn. br. m. 34 (1873). HUSN. Mouss. nord-ouest 43 (1873).

Blindia cirr. C. MUELL. Syn. ii, 585 (1851).

Dicranoweissia cirr. LINDB. loc. cit. et Musc. scand. 25 (1879). MILDE Bry. siles. 49 (1869). SCHIMP. Syn. 2 ed. 55 (1876). JURATZ. Laubm. oesterr.—ung. 21 (1882).

Autoicous; laxly pulvinate, soft, dull or yellowish green above, brown or blackish below; stems flaccid, dichotomous, slightly radiculose, ½—1 in. high. Leaves curled, patulous, from a longish concave base, gradually lineal-lanceolate, rather obtuse, smooth, entire, revolute at margin; nerve vanishing just below apex; cells at base transp. rectangular, above incrassate roundish quadrate, at angles less distinct, lax quadrate. Perich. bracts shorter, broader, sheathing, nerve thin; caps. on a pale seta, erect, subcylindraceous, leptodermous, pale brown with a red mouth, annulus of 2—3 rows of cells; lid pale red shorter than caps. subulate, slightly oblique; teeth lanceolate, undivided, purple below, finely papillose and pale above, inserted below the mouth.

Male infl. gemmaceous, below fem. the bracts concave, ovate, obtuse.

HAB.—On old wooden fences, tree roots, or sometimes on rocks; common. Fr. 12—3.

The capsule varies in length and occasionally is found rather curved or unsymmetric; *Oncophorus Bruntoni* appears to have been confounded with this by the old authors, but is readily distinguished by the different peristome and the denticulate apex of the leaf.

2. DICRANOWEISSIA CRISPULA (*Hedw.*) *Lindb.*

Autoicous; more densely cæspitose; leaves lanceolate-subulate, acute with plane margins, angular cells quadrate, brown; capsule oval, not annulate. (T. XIX, E.)

SYN.—*Weissia crispula* HEDW. Sp. musc. 68, t. 12, f. 1—6 (1801). BRID. Sp. musc. I, 110 (1806); Mant. 42 (1819); Bry. univ. i, 346 (1826). SCHWAEG. Suppl. I, P. I, 75 (1811). ROEHL. Deutsch. fl. iii, 49 (1813); Ann. Wett. ges. iii, 103. HOOK. TAYL. Musc. br. 46, t. 12 (1818). FUNCK Moost. 15, t. 10 (1821). GRAY Nat. arr. br. pl. i, 731 (1821). HOOK. Fl. scot, P. II, 131 (1821); Br. Fl. ii, 22 (1833). DUBY Bot. gall. ii, 571 (1830). NEES HSCH. Bry. germ. ii, P. II, 65, t. 30. f. 15 (1831). HUEBEN. Musc. germ. 129 (1833). DE NOT. Syll. 230 (1838); Epil. bri. ital. 595 (1869). BR. SCH. Bry. eur. fasc. 33—36, p. 9, t. 3 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 127 (1848). WILS. Bry. brit. 48, t. 15 (1855). SCHIMP. Syn. 55 (1860). BERK. Handb. br. m. 293 (1863). HOBK. Syn. br. m. 34 (1873). HUSN. Mouss. nord-ouest 43 (1873).

Grimmia crisp. SM. Fl. brit. 1192 (1804); Eng. Bot. t. 2203. TURN. Musc. hib. 28 (1804). WEB. MOHR Bot. Tasch. 134 (1807). SCHKUHR Deutsch. kr. gew. P. II, 53, t. 23 (1810). VOIT Musc. herb. 30 (1812). SM. Comp. fl. brit. 181 (1825).

Weissia cirrhata β. crispula WAHLENB. Fl. lapp. 323 (1812). HARTM. Skand. Fl. 388.

Weissia falcata NEES HSCH. Bry. germ. ii, P. II, 71, t. 31, f. 16 (1831).

Blindia crisp. C. MUELL. Syn. ii, 584 (1851).

Dicranoweissia crisp. LINDB. loc. cit, et Musc. scand. 25 (1879). MILDE Bry. siles. 49 (1869). SCHIMP. Syn. 2 ed. 54 (1876). JURATZ. Laubm. oesterr.—ung. 19 (1882).

Autoicous; in densely pulvinate soft yellow-green tufts, dark brown or blackish below, 1—2 in. high. Leaves divergent, generally secund above, crisped when dry, flexuose when moist, from a longer, broad concave base, lanceolate-subulate, quite entire, the margin not revolute; nerve vanishing in the long acute point; areolation denser, papillose at back toward apex, basal cells narrow and elongated, angular distinct, brown, quadrate, upper roundish quadrate, chlorophyllose. Perich. bracts sheathing, convolute, pale, oblong obtuse; caps. on a longer pale seta, erect, leptodermous, at first pale brown and narrowly oblong, afterwards reddish brown, broadly ovate and wrinkled, slightly contracted at mouth, exannulate; lid conico-subulate, oblique, shorter than capsule; teeth lanceolate, purple, with 10—12 joints, papillose, often cleft and paler at point.

Male infl. gemmaceous, at apex of innov. bracts ovate, obtuse.

HAB.—Mountain rocks. Fr. 5—7.

Ben Lawers and Craig Chailleach (*Hooker*)!! Anglesea (*Davies*). Pentland hills (*Arnott*). Snowdon (*Wilson*)!! Braemar (*Hunt*)!!

Readily distinguished from the last by its longer acute leaves, distinct perichætium and shorter capsule, and it is also confined to the more elevated mountains. When growing exposed to the constant drip of snow water it assumes a black colour and the leaves and capsules are shorter, it then becomes the var. *atrata* NEES HSCH. and connects itself to *D. compacta* (SCHLEICH.), which has been recorded from Ben Lawers, but the specimen we have received is not the plant; *D. compacta* also is properly regarded by Lindberg as a var. of *D. crispula*.

DICRANUM HEDW.

Fund. musc. II, 91 (1782).

Plants usually tall and handsome, dichotomous, rooting only at base, or the whole stem covered with radicular tomentum. Leaves patent or falcato-secund, smooth or rarely papillose, glossy or opake, long and lanceolate or lanceolate-subulate; nerve semiterete or more or less dilated; areolation narrow and elongated rectangular in the lower part, with the angular cells quadrate dilated vesicular and colored orange or brown, above lineal-oblong quadrate or elliptic, often flexuose; perich. bracts sheathing. Caps. erect or cernuous, rarely striate, with a short equal neck, rarely strumose, generally annulate; lid rostrate; teeth 16, orange or deep red, confluent at base, cleft half way or more into 2 — rarely 3 — unequal subulate legs, striolate at base, trabeculate internally; calyptra cucullate, rostrate, usually falling with the lid. Male infl. gemmaceous. Inhabiting the ground, rocks or rarely trunks of trees. Deriv.—δικρανον a fork.

This very natural genus comprises about 100 species, varying considerably in size; and also in general aspect. As originally established by Hedwig, when the peristome was regarded as affording almost the sole essential character, it included a miscellaneous collection—*Ceratodon purp.*, *Leucobryum*, *Grimmia acicularis*, *Dicranella heteromalla*, *Dichodontium pellucidum* and *Dicranum scoparium*—the last being retained as the type of the genus. In the highest developed forms *D. undulatum*, *Bonjeani*, *scoparium*, &c. constituting Lindberg's section *Eudicranum*, the longitudinal walls of the leaf-cells will be seen, by proper amplification, to be perforated by fine pores, by means of which the cells communicate; these are wanting in the other sections, and in the few species which have papillose leaves as *D. montanum*, the papillæ are simple conical elevations of the cell-cuticle; the vesicular colored angular cells are the most characteristic feature in this genus.

On the felted mass of radicles which clothes the stem of several species, small tubercles form which develope into male gemmæ, and in *D. scoparium* grow on into independent male plants.

The other European species are *D. hyperboreum*, *Anderssonii*, *elatum*, *undulatum*, *fragilifolium*, *strictum*, *Muehlenbeckii*, *brevifolium*, *fulvum*, *albicans* and *comptum*; of these *D. undulatum* is a species which ought to occur here, being found in alpine woods throughout Europe and N. America, but although it has been several times reported from various localities, no genuine specimen

has yet come before us; it is closely allied to *D. Bonjeani*, but has aggregated setæ like *D. majus*.

Several species are extremely variable, and again others are very much alike, so that considerable difficulty is experienced by beginners in their correct determination; this will be best overcome by a careful study of the areolation of the leaf and of transverse sections of the nerve.

CLAVIS TO THE SPECIES.

Sect. 1. ARCTOA. Plants autoicous, radiculose only at base; leaves lanc.-subulate, entire. Capsule small with a tapering or strumose neck.

- Capsule erect, neck tapering. — *fulvellum.*
- Capsule cernuous, neck strumulose.
  - Capsule short ovate.
    - Leaves flexuose patent. — *schisti.*
    - Leaves falcato-secund. — *falcatum.*
  - Capsule oblongo-cylindric.
    - Leaves falcato-secund, lid long-beaked. — *Starkei.*
    - Leaves erecto-patent, lid short-beaked. — *molle.*

Sect. 2. EUDICRANUM. Plants robust, dioicous or pseud-autoicous, tomentose; leaves lanceolate, the longitudinal walls of their cells communicating by fine pores. Caps. cernuous, cylindraceous, more or less arcuate.

- Leaves not undulate.
  - Setæ aggregated, nerve serrated at back towards apex. — *majus.*
  - Setæ solitary, nerve 4-winged at back above. — *scoparium.*
- Leaves transversely undulate.
  - Leaves smooth at back, gradually elongated.
    - Upper cells elongated, nerve smooth at back. — *Bonjeani.*
    - Upper cells small quadrate, nerve serrate at back above. — *Bergeri.*
  - Leaves papillose at back, short and broad, suddenly acuminate. — *spurium.*

Sect. 3. APORODICTYON. Plants of medium size, radiculose; leaves lanc.-subulate, their cell-walls not interrupted by pores. Caps. cernuous or erect, cylindraceous, curved or symmetric.

- Capsule cernuous, curved.
  - Leaves patent, quite entire. — *elongatum.*
  - Leaves secund, serrulate.
    - Nerve $\frac{3}{5}$—$\frac{1}{2}$ width of base, forming all apex. — *fuscescens.*
    - Nerve $\frac{1}{7}$ width of base, not excurrent. — *congestum.*
- Capsule erect, symmetric.
  - Leaves curled when dry, nerve vanishing at the serrulate apex.
    - Subula short, papillose at back. — *montanum.*
    - Subula elongated, smooth at back. — *flagellare.*
  - Leaves scarce altered by drying, nerve excurrent.
    - Leaves gradually narrowed into a subula.
      - Apex quite entire, elongated; lower cells incrassate. — *Scottii.*
      - Apex quite entire, broken off; lower cells lax, hyaline. — *viride.*
      - Apex serrulate, longly subulate; lower cells lax, very long. — *Sauteri.*
    - Leaves suddenly narrowed into a very long setaceous point.
      - Leaves falcato secund.
        - Nerve half width of base, serrate at back. — *longifolium.*
        - Nerve $\frac{1}{6}$ width of base, smooth at back. — *uncinatum.*
      - Leaves erecto-patent, spinulose at back of point. — *asperulum.*

SECT. 1. ARCTOA SCHIMP.

1. **DICRANUM FULVELLUM** (*Dicks.*) *Sm.*

Autoicous; short, densely tufted. Leaves secund, lanceolate-

subulate, entire. Caps. erect, ovate, furrowed when dry; peristome large, spreading. (T. XIX, G.)

SYN.—*Bryum fulvellum* DICKS. Cr. brit. fasc. IV, 10, t. 11, f. 1 (1801).

Dicranum fulvellum SM. Fl. br. iii, 1209 (1804), Eng. Bot. t. 2268. GREV. Scot. cr. fl. t. 188 (1825). BRID. Bry. univ. i, 813 (1826). HOOK. TAYL. Musc. br. 2 ed. 103, Suppl. t. 3 (1827). HOOK. Br. Fl. ii, 43 (1833). MACK. Fl. hib. P. 2, 24 (1836). C. MUELL. Synops. i, 371 (1849). MILDE Bry. siles. 62 (1869). DE NOT. Epil. bri. it. 632 (1869). SCHIMP. Synops. 77 (1860) et 2 ed. 78 (1876). JURATZ. Laubm. Oesterr.—ung. 37 (1882).

Grimmia schisti SM. Fl. br. iii, 1185. Eng. Bot. t. 1952.

Dicr. rupestre WEB. MOHR Bot. Tasch. 185 & 469 (1807).

Dicr. Seligeri BRID. Mant. 59 (1819); Bry. univ. i, 429.

Dicr. Moerchii HORNSCH. in Flora viii, P. I, 78 (1825).

Weissia flexuosa NEES HORNSCH. Bry. germ. ii, P. II, 121, t. 35 (1831).

Arctoa fulvella BR. SCHIMP. Bry. eur. fasc. 33—6, p. 4, t. 1 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 151 (1848). WILS. Bry. br. 59, t. 33 (1855). HARTM. Skand. fl. 9 ed. 71 (1864). BERK. Handb. br. m. 286, t. 23, f. 10 (1863). HOBK. Syn. br. m. 39 (1873).

Autoicous; densely cæspitose, ½—2 in. high, dull green or yellowish above, blackish brown below. Leaves dense, secund, the upper often falcate, lanc.-subulate, glossy, entire or slightly denticulate at apex; angular cells lax, few, flat, the rest very narrow oblong. Perich. bracts from an oblong sheathing base, subulate. Caps. slightly exserted on a reddish-brown seta, erect, oval with a tapering neck, or subcernuous and slightly asymmetric, ferruginous, 8—striate when dry; lid red, obliquely conico-subulate; annulus large; teeth red, spreading horizontally when dry, narrowly lanceolate-subulate, bifid or perforated.

Male infl. gemmiform, below the perichætium, bracts ovate acuminate.

HAB.—Crevices of rocks on the higher mountains. Fr. 7.

Ben More (*Dickson*). Ben Nevis (*Borrer*). Ben Lawers (*Greville*) ! ! Clova (*Drummond*) ! ! Snowdon (*Taylor*) ! ! Llanberis (*Hunt*) ! ! Cronkley Scarr, Teesdale (*Spruce*) ! Striding edge, Great Gable and Scawfell Pikes (*Baker* 1867) ! ! Arncliff wood, Whitby (*Rev. J. F. Crouch*) ! !

The foliage much resembles that of *Blindia acuta*, with which it was confounded, but the angular cells are different and the fruit quite distinct.

2. DICRANUM SCHISTI (*Gunn.*) *Lindb.*

Autoicous; in soft dull green tufts. Leaves lanc.-subulate, entire, flexuose, pellucid with fuscous ang. cells. Caps. ovate, smooth, strumose. (T. XX, A.)

SYN.—*Bryum fol. setaceis curvatis, caps. erectis, obtuse ovatis, capitello oblique rostrato, apophysi capitulo subjecta* OEDER Fl. dan. t. 538, n 2 (1770).

Bryum schisti GUNN. Fl. norveg. P. II, 138 (1772).

Dicranum Blyttii BR. SCHIMP. Bry. eur. fasc. 37—40, p. 26, t. 16 (1847). RABENH. Deutsch. kr. fl. ii, s. 3, 142 (1848). C. MUELL. Synops. i, 364 (1849). WILS. Bry. br. 74; t. 39 (1855). SCHIMP. Synops. 80 (1860), 2 ed. 81 (1876). BERK. Handb. br. m. 277 (1863). MILDE Bry. siles. 64 (1869). HOBK. Syn. br. m. 45 (1873). JURATZ. Laubm. Oesterr.—ung. 39 (1882).

Dicr. schisti LINDB. Act. Soc. scien. fenn. X, 11 (1871), Musc. scand. 24 (1879).

Autoicous; in dull dark green tufts ½—1in. high, fragile, densely cæspitose. Leaves lanceolate-subulate, scarcely secund, flexuoso-patent, soft, entire, nerve excurrent in a fine point; cells below lineal-rectangular, subquadrate above, at angles brown or hyaline. Perich. bracts very large, laxly areolate, with fuscous basal cells, suddenly subulate, the inner sheathing; caps. on a short reddish seta, shortly ovate, subcernuous, more or less incurved, smooth, pale ferruginous, strumulose when dry; lid crenulate at base, conic, with a long oblique beak; annulus simple.

Male infl. far below perichætium, inner bracts shortly acuminate.

HAB.—Crevices of mountain rocks, not common. Fr. 8.

Holwick scarr, Teesdale (*Spruce* 1843) ! Carnedd Llewellyn, Snowdon and Cader Idris (*Wilson*) ! ! Loch-na-Gar (*Black*) ! Ben Lawers (*Wilson*) ! ! Glen Dole, Glen Callater and Bach-na-gairn (*Hunt* 1869) ! ! Glen Prosen (*Fergusson* 1868) !

3. DICRANUM FALCATUM *Hedw.*

Autoicous; loosly tufted. Leaves lanc.-subulate, falcato-secund, crisped, angular cells few, indistinct. Caps. obovate, strumose, smooth, wide-mouthed when dry; peristome blood-red. (T. XX, B.)

SYN.—*Bryum uncinatum* DICKS. Cr. brit. fasc. IV, 11, t. 11, f. 8 (1801).

Dicranum falcatum HEDW. Sp. musc. 150, t. 32, f. 1—7 (1801). SM. fl. brit. iii, 1208 (1804), Eng. Bot. t. 1989. BRID. Sp. musc. I, 224 (1806); Mant. 53 (1819). WEB. MOHR Bot. Tasch. 190 (1807). SCHWAEG. Suppl. I, P. I, 190 (1811). WAHLENB. Fl. lapp. 338 (1812), Fl. carpat. 344 (1814), excl. syn. Dill. ROEHL. Deutsch. fl. iii, 73 (1813). HOOK. TAYL. Musc. brit. 54, t. 15 (1818). FUNCK Moost. 31, t. 21 (1821). GRAY Nat. arr. br. pl. i, 735 (1821). HUEBEN. Musc. germ. 229 (1833). DE NOT. Syll. 216 (1838), Epil. bri. ital. 631 (1869). BR. SCH. Bry. eur. fasc. 37—40, p. 27, t. 18 (1847). RABENH. Deutsch. kr. fl. ii, S. 3, 142 (1848). C. MUELL. Synops. i, 363 (1849). WILS. Bry. br. 79, t. 17 (1855). SCHIMP. Synops. 79 (1860), et 2 ed. 81 (1876). BERK. Handb. br. m. 277 (1863). MILDE Bry. siles. 63 (1869). HOBK. Syn. br. m. 45 (1873). JURATZ. Laubm. Oesterr.—ung. 38 (1882).

Cecalyphum scrophulosum P. BEAUV. Prodr. 51 (1805).

Oncophorus falcatus BRID. Bry. univ. i, 393 (1826).

Autoicous; laxly cæspitose, slender, ascending; ½—1½ in. high, olive green above, black and naked below, dichotomous and fastigiate branched, falcate at apex. Leaves lanc.-subulate, falcato-secund, crisped, convolute concave, entire or denticulate at apex; basal cells narrowly rectangular, quadrate toward margin, the angular very few, brownish, upper quadrate, nerve narrow flattened excurrent. Perich. bracts broad, subvaginant, suddenly setaceous, laxly areolated; caps. on a rather short purplish seta, small, obovate, wide-mouthed, subgibbous, cernuous, smooth with a tumid strumose neck, rufous brown, fuscous or black when old; annulus very narrow, orange, lid from a broad base, obliquely rostellate, purple, half length of capsule; teeth blood-red.

Male infl. close to perich., inner bracts very shortly acuminate.

HAB.—Crevices of rocks and stony ground on the higher mountains. Fr. 8—9.

Ben Lawers, Ben More, Glen Callater and all the Grampian range. Cronkley scars, Teesdale (*Black*). Falcon clints (*R. Barnes* 1879)!! Skye (*Boswell* 1873)!! Snowdon (*Nuttall* 1879)!!

The leaves of all the innovations are sometimes so uniformly and symmetrically curved, as to give the moss a very beautiful aspect.

4. DICRANUM STARKEI *Weber Mohr.*

Autoicous; resembling last, but taller; leaves entire, not crisped, with distinct brown angular cells; caps. oblongo-cylindric, strumose, sulcate when dry, peristome pale red. (T. XX, C.)

SYN.—*Bryum longifolium* DICKS. Crypt. fasc. 3, p. 7 (1793).

Dicranum Starkei WEB. MOHR Bot. Tasch. 189 and 471 (1807). SCHWAEG. Suppl. I, P. I, 191, t. 46 (1811). ROEHL. Deutsch. fl. iii, 74 (1813). Eng. Bot. t. 2227. HOOK. TAYL. Musc. br. 55, t. 17 (1818). BRID. Mant. 53 (1819). FUNCK Moost. 31, t. 21 (1821). GRAY Nat. arr. br. pl. i, 736 (1821). HUEBEN. Bry. germ. 230 (1833). DE NOT. Syll. 216 (1838), Epil. bri. ital. 630 (1869). BR. SCH. Bry. eur. fasc. 37—40, p. 27, t. 17 (1847). RABENH. Deutsch. kr. fl. ii, s. 3, 142 (1848). C. MUELL. Syn. i, 364 (1849). WILS. Bry. br. 74, t. 17 (1855). SCHIMP. Synops. 79 (1860), et 2 ed. 80 (1876). BERK. Handb. br. m. 276 (1863). MILDE Bry. siles. 63 (1869). HOBK. Syn. br. m. 44 (1873). JURATZ. Laubm. Oesterr.—ung. 38 (1882).

Oncophorus Starkei BRID. Bry. univ. i, 394 (1826).

Autoicous; in fragile tufts 1—2 in. high, deep or yellow-green above, fuscous below, resembling *D. falcatum*. Leaves falcato-secund, lanc.-subulate, not crisped, entire or with a few minute teeth at apex, all lower cells elongated, narrowly rectangular, upper shorter, the angular very distinct, quadrate, brown, nerve narrow, excurrent. Perich. bracts broad, sheathing, laxly areolate, suddenly subulate; seta pale red, longer, caps. oblongo-cylindric, gibbous and arcuate, strumose, striate when dry; annulus double, lid conic, with a long oblique beak, peristome pale red.

Male infl. close to perichætium, inner bracts longly acuminate.

HAB.—Same localities as *D. falcatum*. Fr. 8.

All the Breadalbane and Braemar mountains. Snowdon (*Nuttall* 1879)!!

Close to *D. falcatum*, but always distinguishable by the distinct vesicular brown angular cells, the narrower and longer capsule, and the shorter more gradually subulate leaves.

5. DICRANUM MOLLE *Wilson.*

Autoicous; taller, cæspitose; leaves erecto-patent, straight, broadly lanceolate-subulate, entire, nerve vanishing at apex; caps. oblongo-cylindric, curved, substrumose, lid with a short beak. (T. XX, D.)

SYN.—*Dicranum Starkii* Var β. *molle* WILS. Bry. br. 74 (1855).

Dicranum molle WILS. op. c. 75, ut syn. LINDB. Musc. scand. 24 (1879).

Dicr. glaciale BERGGR. in Act. univ. Lund, ii, n. VII, 19, fig. 1—9 (1866). BRAITHW. in Journ. Bot. 1870, p. 228.

Dicr. arcticum SCHIMP. Bry. eur. Suppl. fasc. 3—4, t. 3 (1866); Synops. 2 ed. 93 (1876).

Autoicous; in large dense tufts 2—5 in. high, yellow-green or olivaceous above, fuscescent below, soft; stems slender, simple or dichotomous, eradiculose. Leaves erecto-patent, straight glossy oblongo-lanceolate, subulate, entire, very concave semitubulose above from the incurved margin, auricled at base, nerve narrow compressed vanishing at apex; all cells very narrow linear, the angular numerous orange lax quadrate. Perich. bracts oval-oblong sheathing, laxly areolate, suddenly subulate, imperfectly denticulate at apex; caps. oblongo-cylindric, cernuous incurved substrumose not striated, fuscescent; annulus simple, lid with a short stout oblique beak; peristome purple.

Male infl. close to perichætium, gemmiform, brown, bracts broadly ovate, subulate.

HAB.—On the highest mountains of Scotland. Fr. 7—8.

Ben Nevis (*Hooker*)!! Cairn Taggart and Loch-na-Neem, Braemar (*Black*)!! Ben-mac-dhui (*Hunt* 1868)!! Ben Lawers.

The original name of Wilson is highly appropriate to this beautiful species, referring as it does to its soft silky leaves.

SECT. 2. EUDICRANUM LINDB.

6. **DICRANUM MAJUS** *Smith.*

Pseud-autoicous, tall; leaves from a broad base, lanc.-subulate, falcate, serrate above, not undulate, nerve flattened, excurrent, serrate at back in upper part; setæ pale, aggregated, caps. cernuous, curved, lid with a very long beak. (T. XX, E.)

SYN.—*Bryum reclinatum, foliis falcatis scoparum effigie, setis pluribus* DILL. Hist. musc. 358, t. 46, f. 16, D. (1741), et herbar.

Dicranum majus SM. Fl. brit. iii, 1202 (1804), Eng. Bot. t. 1409. TURN. Musc. hib. 59, t. 4 (1804). WAHLENB. in Act. Holm. 1806, p. 136. SCHWAEG. Suppl. I, P. I, 163, t. 40 (1811). HUEBEN. Musc. germ. 237 (1833). BR. SCHIMP. Bry. eur. fasc. 37—40, p. 43, t. 37 (1847). RABEN. Deutsch. kr. fl. ii, S. 3, 148 (1848). HARTM. Skand. fl. C. MUELL. Syn. i, 360 (1849). WILS. Bry. br. 81, t. 18 (1855). JENS. Bry. dan. 93 (1856). SCHIMP. Synops. 90 (1860), 2 ed. 92 (1876). BERK. Handb. br. m. 279 (1863). MILDE Bry. siles. 71 (1869). DE NOT. Epil. bri. ital. 620 (1869). HOBK. Syn. br. m. 48 (1873). HUSN. Mouss. nord-ouest, 53 (1873). JURATZ. Laubm. Oesterr.—ung. 48 (1882).

Dicr. polysetum p.p. BRID. Sp. musc. I, 174 (1806), Mant. 56 (1819), Bry. univ. i, 413 (1826). ROEHL. Deutsch. fl. iii, 66 (1813).

Dicr. scoparium Var. α. majus HOOK. TAYL. Musc. br. 58, t. 18 (1818). HOOK. fl. scot. P. II, 133 (1821).

Dicr. scoparium TAYL. Ann. Mag. nat. hist. xii, 129 (1843), et Bot. zeit. 1843, p. 695.

Pseud-autoicous; 2—5 in. high, laxly cæspitose, pale or deep green with a silky gloss, pale brown below; stem slender, prostrate below, arcuato-ascending, more or less invested with pale spongy tomentum. Leaves very long, subsericeous, falcato-secund, amplexicaul, lanceolate, longly subulate, canaliculate, sharply serrate in the upper part; nerve broad at base, ending in the apex, sulcate at back and with 5 rows of teeth toward point; cells at

base elongato-rectangular, hyaline and wide next the nerve, the angular colored narrower and incrassate, the upper small narrowly rectangular. Setæ 2—5 in the same perich. rather short, slender pale often convolute, bracts broad short ovate, suddenly aristate, inner oblong convolute, tipped with the excurrent nerve, innermost lingulate obtuse, nerveless; caps. leptodermous, exannulate, cernuous and horizontal, oblong, subarcuate, obsoletely striate, olivaceous green, when old black and strongly incurved, lid with a very long subulate oblique straw-coloured beak, falling with the calyptra, teeth ferruginous red, rather short.

Male infl. gemmiform, nidulant in the cauline tomentum.

HAB.—Banks and rocks in subalpine woods; not uncommon. Fr. 7—8.

Except Dillenius, Smith and Turner, all the older botanists confounded this with *D. scoparium*, from which it is readily distinguished by the polysetous inflorescence, although occasionally solitary capsules may be met with. Dr. Taylor erroneously regarded it as the true *Br. scoparium* of Linnæus.

7. DICRANUM SCOPARIUM (*L.*) *Hedw.*

Dioicous; robust laxly tufted, tomentose. Leaves lanceolate-subulate, secund or falcato-secund, carinate, concave, the margins incurved, serrated above, nerve reaching apex, narrow, with 4 prominent serrated ridges at back in the upper part. Capsule cylindraceous, subarcuate castaneous, lid longly subulate. (T. XXI, A.)

SYN.—*Adiantum aureum medium, foliis tenuissimis, capitulis erectis acutis Bobarti.* RAY Synops. St. brit. App. 237 (1690).

Muscus trichoides minor, foliis oblongis angustis obscure viridibus in longum et prætenuem mucronem desinentibus. RAY Synops. 2 ed. 29 (1696).

Bryum erectis capitulis angustifolium, caule reclinato. DILL. Cat. Giss. 222 (1719), et in RAY Synops. 3 ed. 95 (1724).

Bryum caule inclinato, foliis arrectis subulatis, capitulis erectiusculis. L. Fl. Lapp. 315 (1737).

Bryum reclinatum, foliis falcatis, scoparum effigie. DILL. Hist. musc. 357, t. 46, f. 16 A. B. C. E. H. (1741).

Bryum scoparium L. Sp. plant. 1117 (1753), Syst. nat. ii, 701. HUDS. Fl. angl. 406 (1762). NECK. meth. musc. 224 (1771). WITH. Bot. arr. br. veg. ii, 673 (1776). CURT. Fl. Lond. i, t. 69 (1778). LIGHTF. Fl. scot. ii, 721 (1777). Fl. Dan. t. 824, f. 1 (1780). RELH. Fl. cant. 403 (1785). SM. Eng. Bot. t. 354 (1796). HOFFM. Deutsch. fl. ii, 39 (1796). ABBOT Fl. bedf. 141 (1798). HULL Br. fl. P. II, 261 (1799).

Hypnum scoparium WEISS Cr. goett. 71 (1770). SCOP. Fl. carn. 2 ed. n. 1234 (1772). WEB. Spic. fl. goett. 71 (1778).

Dicranum scop. HEDW. Fund. musc. II, 92, t. 8, f. 41, 42 (1782); Sp. musc. 126 (1801). ROTH Tent. fl. germ. i, 460 (1788) et iii, 158. SIBTH. Fl. oxon. 281 (1794). BRID. musc. rec. II, P. I, 155 (1798), Sp. musc. I, 172 (1806), Mant. 56 (1819), Bry. univ. i, 410 (1826). SWARTZ musc. suec. 34 (1799). ROEHL. Moosg. D. 318 (1800), Deutsch. fl. iii, 42 (1813). RICH. in MICHX. Fl. bor. amer. ii, 297 (1803). STURM Deutsch. fl. II, 13 (1803). SM. Fl. brit. 1201 (1804). TURN Musc. hib. 58 (1804). SCHULTZ Fl. starg. 294 (1806). WEB. MOHR Bot. Tasch. 173 (1807) excl. syn. SCHWAEG. Suppl. I, P. I, 162, t. 42 (1811). WAHLENB. Fl. lapp. 336 (1812), Fl. carp. 343 (1814). VOIT Musc. herbip. 39 (1812). MART. Fl. cr. erl. 97 (1817). HOOK. TAYL. Musc. brit. 57, t. 18 (1818) excl. var. GRAY Nat. arr. br. pl. i, 738 (1821). HOOK. Fl. scot. P. 2, 133 (1821), Br. Fl. ii, 41 (1833). FUNCK Moost. 27, t. 19 (1821). ZENK. DIETR. Musc. thuring. n. 14 (1821). HUEBEN. Musc. germ. 235 (1833). HARTM. Skand. Fl. BALS. DE NOT. Bry. mediol. 135

MACK. Fl. hib. P. 2, 24 (1836). DE NOT. Syll. musc. 212 (1838), Epil. bri. ital. 619 (1869). SCHKUHR Deutsch. kr. gew. P. II, 88, t. 39 (1847). BR. SCHIMP. Bry. eur. fasc. 37-40, p. 34, t. 26 (1847). RABENH. Deutsch. kr. fl. ii, s. 3, 145 (1848). C. MUELL. Synops. i, 359 (1849). WILS. Bry. brit. 78, t. 18 (1855). JENS. Bry. dan. 92 (1856). SCHIMP. Synops. 89 (1860), 2 ed. 91 (1876). BERK. Handb. br. m. 278, t. 23, f. 7 (1863). MILDE Bry. siles. 70 (1869). HOBK. Syn. br. m. 47 (1873). HUSN. Mouss. nord-ouest 53 (1873). JURATZ. Laubm. Oesterr.-ung. 48 (1882).

Fuscina scoparia SCHRANK Baiers. Fl. ii, 452 (1789), Prim. Fl. Salisb. n. 827 (1792).

Mnium scop. GMEL. Syst. nat. ii, 1328 (1791). LAICH. Pl. eur. 476 (1794). WITH. Bot. arr. br. veg. 3 ed. 799 (1796).

Cecalyphum scop. P. BEAUV. Prodr. 51 (1805); Mem. soc. Linn. Par. t. 2, f. 4 (1822).

Dicranum Dillenii TAYL. in Ann. mag. nat. hist. xii, 129 (1843), et Bot. zeit. 1843, p. 695.

Autoicous and dioicous; in large lax rather rigid tufts, yellowish green above, fuscescent below. Stems 2—5 in. high, dichotomous, densely covered with pale or ferruginous tomentum, interrupted by the innovations, which have the leaves longer and more crowded in upper part. Leaves glossy, falcato-secund, rarely straight, the terminal comant, carinate-concave, from an elongated oblong base, lanceolate subulate, sharply serrate at margin; nerve flattened, narrowing upward and reaching apex, at back sulcate and with 4 ridges, serrated toward apex; upper cells linear-rectangular, basal longer subvermicular, the angular large, quadrate orange-brown. Seta solitary, red, bracts convolute in a cylinder, outer from a broad base, narrowly lineal, patulous, serrated, inner convolute with a narrow subula from the rounded apex, nerve obsolete; caps. pachydermous, exannulate, cernuous, rarely suberect, cylindraceous, subarcuate, becoming more curved when old, not striate, castaneous or rufescent; lid convex with a stout rufous subulate beak as long as capsule; teeth solid, bright red, cleft to middle.

Male plants distinct, more slender with infl. terminal, or gemmaceous and nidulant in the tomentum below the perichætia, bracts from an ovate base, narrowly linear.

HAB.—Shady banks, rocks, stone walls, and heaths; common. Fr. 7—8.

Var. *β.* **alpestre** *Hueben.*

More densely tufted, shining fulvous; stem erect nearly straight, with short branches; leaves denser, broader, straight or slightly secund, erecto-appressed, margin and nerve entire or with a few obtuse teeth.

SYN.—*Dicr. scoparium ζ alpestre.* HUEBEN. Musc. germ. 236. DE NOT. Syll. et Epil. MILDE Bry. siles. 70. JURATZ. Laubm. Oesterr.-ung. 49.

HAB.—Subalpine woods; not common. Innisfallen, Killarney (*Hunt* 1864) ! !

Var. *γ.* **recurvatum** (*Schultz*) *Brid.*

Slender, elongated, geniculato-ascending, deep green opake; leaves suddenly larger in the coma, falcato-secund, elongated.

SYN.—*Dicranum recurvatum* SCHULTZ Fl. Starg. 295.

Dicr. scoparium var. recurvatum BRID. Sp. musc. 173, Bry. univ. i, 412. SCHIMP. Synops. HUEBEN. JURATZ.

Dicr. pallidum MITT. in litt.

HAB.— Among grass on sandy ground. Godalming (*Mitten* 1881) ! !

Resembling a small state of *D. majus*, but quite agreeing with *D. scoparium* in the structure of leaf. It appears to me to differ far more from *D. pallidum*, than the latter does from typical *D. scoparium*.

Var. δ. **turfosum** *Milde.*

Tufts tall, glossy, yellow green above, dark fuscous below, with few radicles. Leaves elongated, erecto-patent, subcuspidate at apex, almost entire, or with a few obtuse teeth toward apex and at back.

SYN.—*D. scoparium var. turfosum* MILDE Bry. siles. 71.

HAB.—Moorland bogs. Moor near Blasham beck, Lofthouse, Yorks. (*Wesley* 1878) ! !

This variety deviates much in aspect from all the other forms of *D. scoparium*, approaching somewhat to *D. spadiceum* by the dark colour of the lower leaves.

Var. ε. **orthophyllum** *Brid.*

In dense yellow-green tufts, radiculose. Leaves erect or subsecund, rigid, elongated, entire or distantly and obtusely serrated toward apex.

SYN.—*D. scoparium var. orthophyllum* BRID. l. c. HUEBEN., SCHIMP., MILDE, JURATZ.

HAB.—On heaths. Near Conway ! Ardingly, Sussex (*Davies*). Grewelthorpe moor, Yorks. (*West* 1880) ! ! Carmendow, Derby (*Holt* 1882) ! ! Near Penzance (*Varenne* 1882) ! !

Var. ζ. **paludosum** *Schimp.*

In tall dense bright green tufts, strongly radiculose. Leaves short, broad, subsecund, sharply serrate, rugulose at apex.

SYN.—*D. scoparium var. paludosum* SCHIMP. Synops. 90. MILDE, JURATZ.

HAB.—Moorland bogs. Glen Ogle, Perth (*Boswell* 1873) ! ! Near Loch Maree, Ross (*Boswell* 1875) ! ! Kinder scout (*Holt* 1882) ! !

This very common but elegant moss is the centre of a group of closely allied species, as it is also of a series of varieties, which are troublesome to the student and difficult to define in words; indeed, the acute bryologist Mitten is inclined to regard *D. scoparium* as a compound of several species.

The first point to which attention may be drawn in the typical form, is the condition of the leaf-cells, which in the young and active stage are seen to be crammed with chlorophyl and large oil-globules, these at a later period are used up and all the cells are found to be empty, but in both states the transverse pores are distinctly visible; a patch of the central basal cells is also often thin and hyaline.

Dicr. pallidum SCHIMP. (*D. scoparium* SULLIV. musc. alleg. n. 155) I cannot distinguish from *D. scoparium*, from which it does not differ in male infl. while the paler color of the capsule cannot have much specific value.

Dicr. Venturii DE NOT. of which I have original specimens from Dr. Venturi, collected on the Alps of Saent, I must also refer to *Dicr. scoparium*, and in this opinion I am confirmed by Limpricht, Lindberg and Boswell; although in aspect approaching *D. Bonjeani* it has the stout strongly serrated nerve of the former species, the areolation throughout being rather laxer and

more abbreviated. The plant referred here by Mitten I regard as a variety of the next species.

Dicr. spadiceum ZETTERST. (*D. neglectum* JURATZ.) is an extreme form having much the aspect of a distinct species, but quite agreeing with *D. scoparium* in its areolation. The leaves are quite entire and smooth at back.

From this it will be seen that *D. scoparium* is highly polymorphous, and that the presence or absence of serrated margins to the leaf cannot be relied upon to afford a distinctive character, yet a peculiar facies runs through all its forms which will generally indicate the species, but the microscope must also be used for confirmation.

8. **DICRANUM BONJEANI** *De Not.*

Dioicous; laxly tufted, tomentose. Leaves lanceolate, erecto-patent, glossy, undulated above, nerve lost below the serrated apex. Capsule solitary, subcylindric, slightly curved, striated. (T. XXI, B.)

SYN.—*Dicranum Bonjeani* DE NOT. in LISA Elen. 29, et Syll. musc. 213 (1838), Epil. bri. ital. 616 (1869). C. MUELL. Syn. i, 369 (1849).

Dicr. undulatum (haud EHRH.) TURN. Musc. hib. 59 (1804). SM. Eng. bot. t. 2260 p.p. HOOK. TAYL. Musc. brit. 57, t. 18 (1818). HOOK. Fl. scot. p. 2, 133 (1821), Br. Fl. ii, 41 (1833). GRAY Nat. arr. br. pl. i, 737 (1821). MACK. Fl. hib. P. 2, 24 (1836). JENS. Bry. dan. 90 (1856).

Dicr. palustre (haud LA PYL.) BR. SCH. Bry. eur. fasc. 37-40, p. 39, t. 31 (1847). HARTM. Skand. fl. RABENH. Deutsch. kr. fl. ii, S. 3, 146 (1848). WILS. Bry. br. 79, t. 18 (1855). SCHIMP. Synops. 91 (1860), 2 ed 94 (1876). BERK. Handb. br. m. 279 (1863). MILDE Bry. siles. 72 (1869). HOBK. Syn. br. m. 48 (1873). HUSN. Mouss. nord-ouest 54 (1873). JURATZ. Laubm. Oesterr.-ung. 49 (1882).

Autoicous and dioicous; in large soft lax tufts, stems slender 4—6 in. high, covered with tomentum, at first whitish, finally ferruginous, subcuspidate at apex. Leaves thin, erecto-patent, yellowish-green, very glossy, sharply serrate and minutely transversely undulate above, from a broad base, lanceolate acuminate, acute, nerve vanishing below apex, narrow, smooth at back, or faintly serrate near apex; cells at base large, quadrang. brown, above elongate hexagono-rectangular, upper narrowly elliptic or oblong, Seta solitary, slender, yellowish above, pale red below; bracts short, from a broad base, abruptly subulate, inner longer, convolute, nerve obsolete; capsule leptodermous, cernuous, incurved, turgid obovate-oblong, with a substrumose neck, exannulate, yellowish-brown, striated with orange; calyptra large straw-colored; lid subulate, long as caps. pale red; peristome as in *D. scoparium*. pale purple.

HAB.—In moorland bogs and on damp shady banks; not uncommon. Fr. 7—8.

In fr. Forest of Ballochbui and Kinnoul (*Croall* 1855)! Doune (*McKinlay* 1866)! Levens, Brandt Fell and Bowness (*Barnes* 1867)!!

Var. **β. juniperifolium** (*Sendt.*)

Plants more robust and densely leaved ; leaves broadly lanceolate, rather rigid, brownish.

SYN.—*Dicr. juniperifolium* SENDT. in Denk. cl. Reg. bot. ges. iii, 144 et Flora 1849, I, 59. *Dicr pulustre β juniperif.* B. SCH. Bry. eur. WILS. Bry. br. 79. SCHIMP. Synops.

HAB.—In sand pits in a fir plantation, Stockton forest, York (*Spruce* 1842)!! Ben Lawers (*Wilson* 1855)!! Near Blandford, Dorset (*Boswell* 1867)!! Hills about Killin (*McKinlay* 1862).

Var. γ. **calcareum** *Braithw.*

Stems shorter, more rigid, with pale tomentum; leaves secund, subfalcate, concave with incurved margins, undulate only at apex, and slightly serrated only towards point.

SYN.—*Dicr. Venturii* MITT. in litt.

HAB.—On the ground in calcareous districts; rare. Woolstonbury hill, Godalming, and other similar localities in Sussex *Mitten* 1881)!!

Dicr. palustre was confounded by all the early British botanists with the fine *D. undulatum* EHRH. which is distributed all over the continent, but strangely absent from this country, as is also the still grander *D. elatum* LIND. (*D. robustum* BLYTT.), though both might reasonably have been expected to occur here; both these species resemble *D. majus* in having aggregated setæ.

Dic. palustre LA PYLAIE according to specimens in Bridel's herbarium is a form of *Campylopus flexuosus*, and the specimens in the Dillenian herbarium representing T. 46, fig. 16 C. of Hist. musc. belong to *D. scoparium* and foreign *D. undulatum* EHR. (fide Lindberg).

9. **DICRANUM BERGERI** *Blandow.*

Autoicous; densely tufted, tomentose. Leaves broadly lanceolate, rather obtuse, undulate at margin, nerve vanishing in the erosodenticulate apex, which is smooth at back. Capsule solitary, cylindric, curved, lid rostrate. (T. XXII, B).

SYN.—*Dicranum undulatum* (haud EHRH.) SCHRAD. Spic. fl. germ. 59 (1794). ROTH Fl. germ. iii, 167 (1795). BRID. musc. rec. II, P. I, 157 (1798), Sp. musc. I, 176 (1806), Mant. 57 (1819), Bry. univ. i, 415 (1826). ROEHL. Moosg. Deutsch. 336 (1800), Deutsch. fl. iii, 67 (1813).

Dicranum Bergeri BLAND. Musc. fr. exs. III, n. 114 (1804). C. MUELL. Synops. i, 357 (1849). JENS. Bry. dan. 91 (1856). DE NOT. Epil. bri. ital. 617 (1869).

Dicr. affine FUNCK Cr. gew. Fichtel. VI, p. 2, n. 136 (1806).

Dicr. intermedium CROME in HOPP. Bot. Tasch 1806, p. 186.

Dicr. Schraderi WEB. MOHR Bot. Tasch. 177 (1807). SCHWAEG. Suppl. I, P. I, 166, t. 41 (1811). WAHLENB. Fl. lapp. 336 (1812), Fl. carpat. 344 (1814). FUNCK Moost. 28, t. 19 (1821). HUEBEN. Musc. germ. 241 (1833). BR. SCH. Bry. eur. fasc. 37-40, p. 40, t. 32 (1847). RABEN. Deutsch. kr. fl. ii, s. 3, 147 (1848). HARTM. Skand. fl. WILS. Bry. brit. 80, t. 39 (1855). SCHIMP. Synops. 92 (1860), 2 ed. 95 (1876). BERK. Handb. br. m. 279 (1863). MILDE Bry. siles. 73 (1869). HOBK. Syn. br. m. 48 (1873). JURATZ. Laub. Oesterr.-ung. 50 (1882).

Autoicous; densely cæspitose, bright or fuscous green, tumid. Stem erect, 2—6 in. high, covered with rufous tomentum below. Leaves densely imbricated, erecto-patent or subsecund above, somewhat crisped when dry, the younger glossy green, the lower pale, long,

broadly lanceolate, rather obtuse, channelled below, carinate above, margin strongly undulate from middle to apex, sharply serrate and also at back of nerve which vanishes below apex; cells at base narrowly rectang. at angles suddenly much dilated, subquadrate, orange, above subrhombic-quadrate, irregular, mammosely protuberant at back. Perich. bracts convolute with a short point; capsule on a greenish-yellow seta, rather small, incurved-oblong, cernuous, obsoletely striate; annulus of 3 rows of cells; lid long-beaked, long as caps.

Male infl. very small, gemmaceous, nestling in the tomentum.

HAB.—Boggy heaths; rare. Fr. 8—9.

Risley moss, Warrington (*Wilson*)! Wybunbury bog in fr. (*Wilson*)!!

10. DICRANUM SPURIUM *Hedwig.*

Autoicous; laxly tufted, tomentose. Leaves broadly lanceolate, acute, undulate, eroso-denticulate, papillose at back, nerve vanishing. Capsule solitary, cylindric, arcuate, lid rostrate. (T. XXII, A.)

SYN.—*Dicranum spurium* HEDW. Musc. frond. ii, 82, t. 30 (1788), Sp. musc. 141 (1801). TIMM Fl. meg. n. 784 (1788). ROTH Fl. germ. iii, P. I, 178 (1795). BRID. Musc. rec. II, P. 1, 171 (1798), Sp. musc. I, 200 (1806), Mant. 65 (1819), Bry. univ. i, 416 (1826). SWARTZ Musc. suec. 33 (1799). ROEHL. Moosg. deutsch. 352 (1800), Deutsch. Fl. iii, 68 (1813). SMITH Fl. brit. iii, 1222 (1804), Eng. Bot. t. 2167. WEB. MOHR Bot. Tasch. 178 (1807). SCHWAEG. Suppl I, P. I, 179 (1811). VOIT Musc. herb. 40 (1812). MART. Fl. cr. erl. 103 (1817). HOOK. TAYL. Musc. br. 56, t. 17 (1818). FUNCK Moost. 29, t. 20 (1821). HOOK. Fl. scot. p. 2, 133 (1821); Br. Fl. ii, 40 (1833). GRAY Nat. arr. Br. pl. i, 737 (1821). HUEBEN. Musc. germ. 242 (1833). DE NOT. Syll. musc. 214 (1838); Epil. 618 (1869). HARTM. Skand. fl. BR. SCH. Br. eur. fasc. 37-40, p. 41, t. 33 (1847). RABEN. Deutsch. kr. fl. ii, S. 3, 147 (1848). C. MUELL. Synops. i, 356 (1849). WILS. Bry. brit. 80, t. 18 (1855). JENS. bry. dan. 91 (1856). SCHIMP. Synops. 93 (1860); 2 ed. 96 (1876). BERK. Hand. br. m. 280 (1863). MILDE Bry. siles. 73 (1869). HOBK. Syn. br. m. 49 (1873). HUSN. Mouss. nord-ouest 54 (1873). JURATZ. Laubm. Oesterr.-ung. 51 (1882).

Mnium spurium GMEL. Syst. nat. ii, 1328 (1791). LAICH, Pl. eur. 476 (1794).

Bryum spurium HOFFM. Deutsch. fl. ii, 38 (1796). DICKS. Pl. crypt. Fasc. 4, 13 (1801).

Cecalyphum spurium P. BEAUV. Prodr. 51 (1805).

Autoicous; robust, crowded into lax fragile tufts, glossy bright or yellowish green. Stems dichotomous, erect or decumbent, 3—6 in. high, fasciculate-leaved, covered with rufescent tomentum. Leaves shorter below, ovato-lanceolate, upper crowded into a dense coma, patent, when dry incurved, subcirrate, broadly lanceolate, attenuated rapidly to a point, very rugose, serrated at margin, papillose at back of apex; nerve thin, vanishing at apex, denticulato-scabrous at back of point; cells at base short, incrassate, above elongato-rectang. upper short, polymorphous. Perich. bracts ovate subulate, inner elongate convolute sheathing, with a short point; caps. oblong, subcylindric, incurved, obsoletely striate, pale yellow-brown, when dry curved cernuous, deeply sulcate and contracted below mouth; annulus of 2 series of cells; lid long as caps. obliquely rostrate; per. of *D. scoparium* with subulate legs.

Male infl. gemmaceous, nidulant in the tomentum.

HAB.—Wet sandy heaths and bogs, not common. Fr. 7.

Angus-shire (*Don*). Barmby moor, Yorks. (*Teesdale, Spruce* c. fr.). Stockton forest and Langwith moor, York (*Spruce* 1842)! Kinnordy, Scotland (*Lyell*). Waterdown and Broadwater forests, Tunbridge Wells (*Mitten*). Foot of Mt. Shade, Stra'an, Banchory c. fr. (*Sim* 1877)!! Ripon, Yorks. Trossachs (*Stirton* 1865).

Readily known from the last by its broader leaves with shorter more acute points, papillose at back.

11. DICRANUM CONGESTUM *Bridel.*

Dioicous; tomentose; upper leaves crowded, secund, linear-lanceolate, somewhat crisped, remotely serrate above, upper cells large, angular, nerve ½ width of base, vanishing at apex; capsule pale, oblique, smooth. (T. XXII, C.)

SYN.—*Dicranum congestum* BRID. Sp. musc. I, 176 (1806); Mant. 57 (1819); Bry. univ. i, 418 (1826). SCHWAEG. Suppl. I, p. I, 168, t. 42 (1811). ROEHL. Deutsch. fl. iii, 67 (1813). FUNCK Moost. 28, t. 19 (1821). LINDB. musc. scand. 24 (1879).

Dicranum fuscescens p.p. plur. auct.

Dioicous; stem erect 1—2 in. high, densely clothed with ferruginous tomentum, fastigiate-branched, yellowish green. Leaves more or less secund, crispate when dry, broadly lanceolate with a short point, canaliculate at base, carinate above; nerve narrow and thin, ½ width of base, lost at apex, smooth or remotely serrate at back and less prominent, margins remotely and coarsely serrate above; cells at base elongated, very narrow, the angular brown, incrassate, quadrate, upper 2—3 times larger than in *D. fuscescens*, irregular in form, at back rarely faintly spinulose. Per. bracts sheathing, the nerve excurrent as a short subula, seta tall, straw-colored, caps. ovate-oblong, cernuous, smooth, pale brown, more leptodermous, annulus double, lid pale, conic with a long oblique beak, teeth pale purple, spores greenish.

HAB.—Mountain rocks, very rare. Fr. 8.

Ben Lawers (*Boswell* 1873)!! a few stems intermixed with *D. fuscescens*.

Var. *β.* **flexicaule** (*Brid.*) *Br. Sch.*

Stem much elongated, flexuose, reclining at base, scarcely tomentose; leaves elongated, laxer, falcato-secund, almost entire, yellowish green; caps. more curved, cernuous,

SYN.—*Dicr. flexicaule* BRID. Bry. univ. i, 42.

Dicr. congestum var. flexicaule BR. SCH. Bry. Eur. fasc. 37—40, p. 36, t. 29 γ.

Dicr. fuscescens var. flexicaule WILS. Bry. br. 77. SCHIMP. Syn. 88, et 2 ed. 90. DE NOT. Epil. 622. MILDE Bry. sil. 69. JURATZ. Laubm. Oesterr.-ung. 46.

HAB.—Mountain rocks, not common.

Near the High Force, Teesdale (*Spruce* 1843)! Ben Lawers (*Hunt* 1865)!! Loch-na-Gar (*Black*).

This moss has been almost universally combined with *D. fuscescens*, until Lindberg pointed out the distinctive characters; the broader leaves with

much narrower nerve and large irregular apical cells are quite sufficient to separate it, and in habit it approaches far nearer to *D. Bonjeani* than to *fuscescens*, while the areolation at the lower part resembles that of *D. scoparium*, with pores in the cell walls.

SECT. 3. APORODICTYON LINDB.

12. DICRANUM FUSCESCENS *Turner.*

Dioicous; leaves patent or secund, narrow, longly subulate, flexuose, closely serrulate at margin and back, upper cells small, quadrate, nerve ⅔—½ width of base, forming all upper part of subula; capsule rufous, less oblique, lightly striate. (T. XXII, D.)

SYN.—*Dicranum fuscescens* TURN. Musc. hib. 60, t. 5, f. 1 (1804). SMITH Fl. brit. iii, 1204 (1804), Eng. Bot. t. 1597. WILS. Bry. br. 77, t. 18, β (1855). SCHIMP. Synops. 87 (1860), 2 ed. 89 (1876). BERK. Handb. br. m. 278 (1863). MILDE Bry. sil. 69 (1869). DE NOT. Epil. 621 (1869). HOBK. Syn. br. m. 47 (1873). LINDB. Musc. scand. 23 (1879). JURATZ. Laubm. Oesterr.-ung. 45 (1882).

Dicranum rupestre BRID. Sp. musc. I, 177 (1806); Mant. 58 (1819); Bry. univ. i, 419 (1826).

Dicr. scoparium β. *fuscescens* WEB. MOHR Bot. Tasch. 174 (1807). HOOK. TAYL. Musc. brit. 58, t. 18, β. (1818). GRAY Nat. arr. Br. pl. i, 738 (1821).

Dicr. longirostre SCHWAEG. Suppl. I, P. I, 170, t. 44 (1811).

Dicr. scoparium c. *rupestre* ROEHL. Deutsch. Fl. iii, 66 (1813).

Dicr. congestum p.p. HUEBEN. Musc. germ. 244 (1833). HARTM. Skand. fl. BR. SCH. Bry. eur. fasc. 37-40, p. 36, t. 29 (1847). RABEN. Deutsch. kr. fl. ii, S. 3, 146 (1848). C. MUELL. Synops. i, 360 (1849).

Dicr. Kinlayanum SCHIMP. MSS.

Dioicous; stem erect, 1—4 in. high, tomentose, fastigiate-branched. Leaves crowded, subsecund falcate subulate carinate, slightly crisped when dry, subula very long, deeply channelled; nerve thick, prominent at back ⅔—½ width of base, forming all the plano-convex point of subula, strongly and densely serrulate at back, margins densely and minutely serrulate; cells at base rectangular elongate, the angular lax quadrate brown, upper small, regularly quadrate, spinuloso-papillose at back. Per. bracts sheathing, abruptly narrowed into a longer subula formed of the nerve; seta stouter, fulvous, caps. oblong, rufous-brown, longer, thicker, less oblique, with a narrower mouth, pachydermous, lightly sulcate, annulus subtriple, lid long as capsule, conic with an oblique pale beak; peristome intense purple, spores brownish.

Male plants slender, intermixed with female; infl. terminal, bracts concave, lanceolate, subulate.

HAB.—Wet rocks in mountain districts, not uncommon; frequent on all the Scotch mountains. Fr. 8.

Var. β. **falcifolium** *Braithw.*

Densely tufted, deep green, fastigiate; leaves all falcato-secund, flexuoso-cirrhate toward apex, shorter and less attenuated to point.

HAB.—Holwick Scarr, Teesdale (*Spruce*, 1843)! Hills behind Dunoon (*Stirton*, 1865)!!

D. fuscescens is somewhat like a small state of *D. scoparium*, but is readily known by its slightly curled leaves with short cells free from transverse pores, and its pale striated capsule. It is very variable in size and colour, and also in the curving of the leaves.

13. DICRANUM ELONGATUM *Schleich.*

Dioicous; compactly tufted, stems slender, elongated, leaves lanceolate-acuminate, entire, nerve excurrent; capsule ovate, cernuous, lid with a long oblique beak. (T. XXIII, A.)

SYN.—*Dicranum elongatum* SCHLEICH. Pl. crypt. helv. Cent. III, n. 27 (1806). SCHWAEG. Suppl. I, P. I. 171, t. 43 (1811). BRID. Mant. 60 (1819), Bry. univ. i, 429 (1826). FUNCK Moost. 28, t. 19 (1821). DE NOT. Syll. musc. 215 (1838), Epil. briol. ital. 622 (1869). HARTM. skand. fl. BR. SCH. Bry. eur. fasc. 37-40, p. 35, t. 28 (1847). C. MUELL. Synops. i, 365 (1849). SCHIMP. Synops. 86 (1860), 2 ed. 88 (1876). MILDE Bry. siles. 68 (1869). FERGUSS. in Scot. Nat. V, 129 (1879). JURATZ. Laubm. Oesterr-ung. 45 (1882).

Dic. sphagni WAHLENB. Fl. lapp. 337 (1812). BRID. Mant. 68 (1819), Bry. univ. i, 461 (1826).

Dioicous; in compact cushioned tufts, densely interwoven with ferruginous tomentum, yellowish green above, rufo-fuscous below. Stems 3—6 in. high, slender fastigiate-branched; leaves secund and erecto-patent, appressed when dry, from an oblong lanceolate base, subulate acute, entire or faintly toothed at apex, the wings convolute above; nerve narrow, excurrent, lower cells elongato-rectangular, the angular orange, quadrate, upper minute oblong. Perich. bracts cylindraceo-vaginant, suddenly subulate; caps. on a short pale brown seta, subcernuous, subgibbous-ovate, with a distinct neck, lightly striate, greenish brown, annulus narrow, lid conic with a pale subulate beak longer than caps, teeth irregular, rufous-red.

Male pl. very slender, intermixed with the fem. or in separate tufts; infl. secund, bracts ovate, subulate.

HAB.—Peaty places on mountain rocks; rare. Fr. 8. Corrie Ardor, Inverness (*Barker & Roy*, 1870). Little Craigandal, Braemar (*Fergusson & Roy*, 1873).

Readily known by its long straight stems densely compacted up to the coma with rusty sponge-like tomentum, and by its acute leaves, entire or with a few irregular teeth at apex.

14. DICRANUM MONTANUM *Hedw.*

Dioicous; in dark green cushioned tufts. Leaves curled when dry, lanceolate-subulate, papillose at back, nerved to apex, margin crenulate above. Caps. erect, cylindric-oval, lid rostrate, oblique. (T. XXIII, B.)

SYN.—*Dicranum montanum* HEDW. Sp. musc. 143, t. 35, f. 8-13 (1801). P. BEAUV. Prodr. 54 (1805). BRID. Sp. musc. I, 200 (1806), Mant. 65 (1819), Bry. univ. i, 454 (1826). WEB. MOHR. Bot. Tasch. 179 (1807). SCHWAEG. Suppl. I, P. I, 178 (1811). WAHLENB. Fl.

lapp. 337 (1812), Fl. carp. 345 (1814). ROEHL. Deutsch. fl. iii, 68 (1813). FUNCK Moost. 29, t. 20 (1821). HUEBEN. Musc. germ. 252 (1833), excl. syn. HARTM. Skand. fl. BR. SCHIMP. Bry. eur. fasc. 37-40, p. 29, t. 20 (1847). C. MUELL. Synops. i, 379 (1849). SCHIMP. Synops. 81 (1860), 2 ed. 82 (1876). DE NOT. Epil. bri. ital, 628 (1869). MILDE Bry. siles. 64 (1869). HUSN. mouss. nord-ouest 52 (1873). JURATZ. Laubm. Oesterr. ung. 41 (1882).

Weissia truncicola DE NOT. Epil. 598 (1869).

Dioicous; densely pulvinate-cæspitose, interwoven with ferruginous tomentum, deep green above, pale ferruginous below, ½—1 in. high. Leaves soft, patent and subsecund, strongly curled when dry, lanceolate-subulate, subtubulose in upper part, opake, papillose at back; margin crenulato-denticulate and incurved in upper half, nerve lost at apex, bluntly toothed at back, ¼—⅕ width of base, cells at base lax and elongate, the angular few thin, in 5 rows, upper minute quadrate. Perich. bracts longly sheathing, suddenly subulate; caps. on a pale brown seta, leptodermous, oblong, subcylindric, slightly curved, pale brown, lid paler, conical, rostrate, long as capsule, teeth bright red, narrow, arcuato-incurved.

Male pl. slender, bracts from an ovate base, acuminate subulate.

HAB.—About roots and trunks of trees in woods; rare and sterile. Fr. 7—8.

At base of oaks, Sutton Park, Birmingham (*Bagnall* 1870)!! Abbey wood and Bostol wood, Kent (*Holmes* 1874)!! Corley woods, Coventry; Crackley wood, Kenilworth; Boultbie wood and woods at Meridan shafts, Fillongley; Shrawberry wood, Shustoke; Harding's wood and Birchmoor stumps, Maxtoke, and on alder at Brown's wood, Solihull (*Bagnall* 1881)!! Aspley woods, Luton, with *D. scoparium* (*Saunders* 1882)!! Den of Airlie, Forfar (*Sim* 1876)!!

Although much resembling *D. flagellare*, this is at once distingnished by its denser deep green tufts, strongly curled leaves, papillose at back, with margins more extensively serrulate and less incurved.

15. DICRANUM FLAGELLARE *Hedw.*

Dioicous; densely tufted, usually producing fragile axillar small leaved ramuli; leaves lanc. subulate, concave, subsecund, smooth at back, nerved to apex, denticulate at point; caps. long, cylindric, striate, lid with a long oblique beak. (T. XXIII, C.)

SYN.—*Dicranum flagellare* HEDW. Musc. fr. iii, 1, t. 1, f. 1 (1792), Sp. musc. 130 (1801). SCHRAD. Spic. fl. germ. 59 (1794). ROTH Fl. germ. iii, 165 (1795). BRID. Musc. rec. II, P. I, 160 (1798), Sp. musc. I, 178 (1806). Mant. 58 (1819), Bry. univ. i, 422 (1826). ROEHL. Moosg. deutsch. 328 (1800), Deutsch. fl. iii, 65 (1813). P. BEAUV. Prodr. 63 (1805). SCHULTZ Fl. starg. 297 (1806). WEB. MOHR Bot. Tasch. 173 (1807). SCHWAEG. Suppl. I, P. I, 176 (1811). VOIT Musc. herb. 41 (1812). WAHLENB. Fl. lapp. 337 (1812). MART. Fl. cr. erl, 101 (1817). FUNCK Moost. 29, t. 20 (1821). HUEBEN. Musc. germ. 250 (1833). HARTM. Skand. Fl. MACKAY Fl. hibern. P. 2, 23 (1836), BR. SCH. Bry. eur. fasc. 37-40, p. 30, t. 21 (1847). C. MUELL, Synops. i, 381 (1849). JENS. Bry. dan. 92 (1856). SCHIMP. Synops. 82 (1860), 2 ed. 84 (1876). MILDE Bry. siles. 65 (1869). HUSN. mouss. nord-ouest 52 (1873). JURATZ. Laubm. Oesterr-ung. 41 (1882). HOLMES in Journ. Bot. 1874, p. 225, t. 149.

Bryum flagellare HOFFM. Deutsch. fl. ii, 37 (1796).

Dioicous; densely tufted, repeatedly dichotomous, 1—2 in. high, deep or yellow-green above, rufescent below, interwoven with radicles;

generally giving off from the axils of upper leaves, numerous filiform shoots, with minute lanceolate imbricated nerveless leaves. Leaves forming a comal tuft, lanceolate-subulate, somewhat crisped when dry and variously twisted at apex, subfalcate secund, convolute-concave, sparingly serrulate at point, nerve carinate, $\frac{1}{6}$ width of base, vanishing in the apex, cells at base lax, elongate, the angular numerous thin quadrate yellow, the upper very small quadrate, smooth at back. Perich. bracts convolute, sheathing, gradually subulate; caps. on a pale slender seta, elongate, cylindric, olivaceous, striate, and when dry remotely sulcate, annulus of one series of cells; lid with a long beak, oblique, fuscous.

Male pl. more slender, bracts from a broad concave base, suddenly acuminate.

HAB.—Rotten trunks of trees, especially of chestnuts; very rare. Fr. 8.

Abbey wood and Bostol wood, Kent (*Holmes* 1874)!! sterile. Recorded also by Taylor in Fl. hibern. from Glen-flesk, Kerry.

Turner's *D. flagellare* with fr. from Lough Bray is *D. Scottii*, and the barren one from Cromford moor according to Wilson is *Campylopus flexuosus*. *D. flagellare* much resembles the last species but is more robust, the leaves less curled, with the apex only feebly toothed and smooth at back. The flagella are usually absent from the lax barren tufts.

16. **DICRANUM VIRIDE** (*Sull. Lesq.*) *Lindb.*

Dioicous; densely pulvinate, tomentose at base; leaves erecto-patent, very fragile, from an oblong base lanceolate-subulate, quite entire, nerve excurrent; caps. erect, oblong, slightly curved; lid conico-rostrate. (T. XXIII, D.)

SYN.—*Dicr. thraustophyllum* SPRUCE MSS. 1850.

Campylopus viridis SULL. LESQ. Musc. bor. am. n. 72 (1856) et 2 ed. n. 91 (1865). SULLIV. Moss. un. st. 103 (1856); Ic. musc. 30, t. 18 B (1864).

Dicr. thraustum SCHIMP. MSS. 1862.

Dicr. viride LINDB. in Hedwigia ii, 70 in obs. (1863), in RAB. Bryoth. n. 1061 (1869). SCHIMP. Bry. eur. suppl. fasc. 3-4, p. 1, t. 1 (1866), Synops. 2 ed. 83 (1876). DE NOT. Epil. br. it. 630 (1869). MILDE Bry. siles. 65 (1869). HOBK. Syn. br. m. 46 (1873). JURATZ. Laubm. Oesterr-ung. 40 (1882). HUSN. mouss. nord-ouest 2 ed. 47 (1882).

Dicr. fulvum D. viride* LINDB. in HARTM. Sk. Fl. 9 ed. ii, 68 (1864).

Dioicous; pulvinato-cæspitose, rigid, dull deep-green above, ferruginous and tomentose below, fastigiate-branched. Leaves crowded, erect, longer and subfalcate in the coma, patent, curved upward from the middle, very fragile in the upper part and rarely perfect, from an oblong lineal-lanceolate base, subulate, entire; nerve flat, $\frac{1}{3}$ width of base, excurrent in a smooth channelled subula; cells shortly rectangular, lax and chlorophyllose at base, except the middle ones which are

hyaline, small and quadrate above. Perich. bracts elongate, inner longly sheathing, suddenly subulate; seta yellow, capsule oblong, erect slightly asymmetric, yellowish brown, lid conico-rostrate, yellow.

HAB.—Trunks of trees and old rails; very rare. Fr. 7—8.

On decaying oak rails ½ mile from Abbot's Bromley, Stafford, sterile (*Bloxam* 1864)!!

Intermediate between *D. montanum* and *Scottii*, and remarkable for the great brittleness of the leaves. *D. strictum*, SCHLEICH, and *fragilifolium*, LINDB. are also closely allied species. This plant may have been imported attached to the wood on which it was found, and thus its very limited area accounted for; it is scattered sparingly throughout Central Europe from Sweden and Finland to Italy.

17. DICRANUM SCOTTII *Turner.*

Dioicous; densely tufted, leaves patent, lanc.-subulate, entire, not crisped when dry, the nerve excurrent; caps. elongate-elliptic, not striate, lid obliquely rostrate, teeth short, nearly entire. (T. XXIII, E.)

SYN.—*Dicr. Scottianum* TURN. Musc. hib. 75, t. 6. f. 1 (1804). SMITH Fl. br. iii, 1226 (1804), Eng. Bot. t. 1391 et 1977 p.p. BRID. Sp. musc. I, 209 (1806), Bry. univ. i, 455 (1826). HOOK. TAYL. Musc. br. 56, t. 18 (1818). GRAY Nat. arr. br. pl. i, 737 (1821). HOOK. Fl. Scot. P. 2, 133 (1821). MACK. Fl. hibern. P. 2, 23 (1836). BR. SCH. Bry. eur. fasc. 37-40, p. 31, t. 23 (1847). RABEN. Deutsch. kr. fl. ii, P. 3, 144 (1848). C. MUELL. Synops. i, 381 (1849). WILS. Bry. Br. 75, t. 18 (1855). SCHIMP. Synops, 83 (1860), 2 ed. 85 (1876). BERK. Handb. br. m. 277 (1863). MILDE Bry. siles. 67 (1869). HOBK. Syn. br. m. 46 (1873). HUSN. Mouss. nord-ouest 52 (1873).

Campylopus Scottianus BRID. Mant. 72 (1819).

Dicranum flagellare TURN. Musc. hib. 61 (1804). SM. Eng. Bot. t. 1977 p.p. HOOK. Br. fl. ii, 41 (1833).

Dioicous; in dense rounded tufts, yellow green above, fuscescent below, with ferruginous tomentum. Stem erect 2—3 in. high, dense-leaved. Leaves patent and subsecund, rigid, rather glossy, flexuose at apex when dry, quite entire, lanceolate-subulate; nerve thick, excurrent; cells small and quadrate above, elongated at base, the angular lax, quadrate, brown. Perich. bracts sheathing, suddenly subulate, seta elongated reddish yellow; caps. elongate elliptic, with a long neck, often subincurved, tawny brown, not striate, cylindric and subplicate when dry, small-mouthed; annulus simple, lid pale, obliquely rostrate; teeth short, nearly entire or 2—3-fid at apex only, fragile, pale red.

Male plants in distinct tufts, slender, more branched; outer bracts lanceolate subulate.

HAB.—Shady sub-alpine rocks; not common. Fr. 7—8.

Swanlibar, Ireland (*Scott*). Blackwater bridge (*Taylor*). Glena and Cromagloun, Killarney (*Carroll* 1861). Common in Sussex on sandstone (*Mitten*). Dewerstone rocks and Plymouth (*Holmes* 1867)!! Tarbert, Cantire and Colintraive, Argyle (*Hunt* 1866)!! Loch Maree (*Hunt* 1866). Lough Bray and Kylemore, Galway (*Moore*). On an old tree near O'Sullivan's cascade (*Schimper* 1865).

This very pretty moss appears to be more prevalent with us than in any other part of Europe, unless it has been overlooked for *D. flagellare*; from this

it may be readily known by its very dense acute entire-pointed leaves and stout excurrent nerve. From *D. fuscescens*, which it also resembles, its very acute entire smooth subula will always separate it.

18. DICRANUM SAUTERI *Br. Sch.*

Dioicious; in large soft silky tufts; leaves falcato-secund, lanc.-subulate, entire, nerve one-fifth width of base; caps. elliptico-cylindric, lid obliquely rostrate. (T. XXIV, A.)

SYN.—*Dicranum Sauteri* BR. SCH. Bry. eur. fasc. 37-41, p. 33, t. 24 (1847). C. MUELL. Synops. i, 375 (1849). SCHIMP. Synops. 85 (1860), 2 ed. 87 (1876). DE NOT. Epil. bri. ital. 626 (1869). MILDE Bry. siles. 68 (1869). JURATZ. Laubm. Oesterr.-ung. 43 (1882).

Dioicous; in dense cushioned glossy green tufts, becoming fulvous, fuscous at base, with brown tomentum. Leaves very dense, rather rigid, secund or falcate, channelled, lanceolate, gradually subulate, entire or with a few teeth at point, nerve one-fifth width of base, excurrent, cells at base narrow and elongated, angular lax, quadrate, brown, upper elongated. Perich. bracts sheathing, longly subulate, caps. cylindraceous, erect, slightly asymmetric, annulus simple, lid conic, obliquely rostrate, long as capsule, teeth red, cleft one-third.

Male plant shorter, slender.

Var. *β.* **curvulum** *Lindb.*

Capsule horizontal, more or less curved.

HAB.—Sub-alpine rocks; very rare. Fr. 8—9.

The var. *β.* only is with some doubt admitted as British, and its claim as such rests on specimens in a collection of the late A. O. Black, unnamed and mixed with *D. molle* and *fulcatum*, the labels bearing localities in Braemar (Cairn Taggart, Loch-na-Neem and Freuch Corrie); Prof. Lindberg identified it with a precisely similar form found in the Pyrenees. The Marchese Bottini regards *D. Sauteri* as a variety of *D. longifolium*, from which it seems to me to be sufficiently distinct in the leaf-base and section of nerve.

19. DICRANUM LONGIFOLIUM *Ehrh.*

Dioicous; in large soft silky pale green tufts; leaves falcato-secund, lanc.-subulate, serrulate above at back and margin, nerve one-third width of base; caps. cylindraceous, lid pale, obliquely subulate. (T. XXIV, B.)

SYN.—*Dicranum longifolium* EHRH. Dec. crypt. n. 114 (1786). HEDW. musc. fr. iii, 24. t. 9 (1792), Sp. musc. 130 (1801). ROTH Fl. germ iii, P. I, 166 (1795). BRID. musc. rec. II, P. I, 161 (1798), Sp. musc. I, 183 (1806), Mant, 60 (1819), Bry. univ. i, 430 (1826). SWARTZ musc. suec. 34 (1799). ROEHL. Moosg. deutsch. 334 (1800), Deutsch. fl. iii, 66 (1813). SCHULTZ Fl. starg. 297 (1806). WEB. MOHR Bot. Tasch. 172 (1807). SCHWAEG. Suppl. I, P. I, 176 (1811). VOIT musc. herb. 42 (1812). WAHLENB. Fl. carp. 344 (1814). FUNCK Moost. 29, t. 20 (1821). HUEBEN. musc. germ. 248 (1833). DE NOT. Syll. musc. 215 (1838), Epil. bri. ital. 625 (1869). HARTM. Skand. Fl. BRUCH SCHIMP. Bry. eur. fasc. 37-40, p. 32, t. 25 (1847). RABEN. Deutsch, kr. fl. ii, P. 3, 144 (1848). C. MUELL. Synops. i, 371 (1849). SCHIMP. Synops. 84 (1860), 2 ed. 86 (1876). MILDE Bry. siles. 67 (1869). HOBK. Syn. br. m. 46 (1873). JURATZ. Laubm. Oesterr.-ung. 43 (1882).

Dicr. Stirtoni WILS. MSS. a short leaved form.

Dioicous; in soft lax silky pale green tufts, fuscous below, black at base; stem arcuato—or geniculato—ascending, slender, dichotomous, falcate at apex, sparingly radiculose. Leaves long, rather rigid, falcato-secund, from a lanceolate base, longly capillaceo-subulate, subtubulose above, nerve very broad, ⅓ width of base, occupying all upper part of leaf, serrate at back and margin, cells at base small narrow, the angular lax, brownish, upper elongated rectangular. Inner perich. bracts convolute-sheathing, abruptly apiculate with the excurrent nerve, caps. erect, elongato-cylindraceous, straight or subincurved, estriate, fuscous; lid pale, with a subulate beak, long as capsule, teeth small, red, deeply cleft.

Male plant more slender, bracts falcate, innermost shortly acuminate.

HAB.—Stones and trunks of trees in mountains; rare. Fr. 8—9.

Maidenbower Crags, Dumfries, with *Grimmia patens* (Herb. Kew). Ben Lawers (*Stirton* 1865)!! Glen Prosen (*Fergusson* 1868); all sterile.

Next to this comes another European species, *Dicr. albicans*, BR. SCH. (*D. enerve*, THED.), which has a still greater development of nerve, and in fact constitutes a transition to *Leucobryum*.

20. DICRANUM ASPERULUM *Mitt.*

Dioicous; in silky tufts, tomentose at base; leaves falcate or flexuose, subovate at base, longly subulate with the serrulate nerve, spinulose at back; caps. erect, oval-cylindric, lid straight, rostrate. (T. XVII, H.)

SYN.—*Dicranodontium asperulum* p.p. WILS. in Kew Journ. Bot. IX, 296 (1857).

Dicranum asperulum MITT. Journ. Lin. Soc. i, Suppl. 22 (1859). RABENH. Bryoth. eur. n. 940.

Dicranodontium aristatum SCHIMP. Synops. 695 (1860), 2 ed. 99 (1876). Bry. eur. suppl. fasc. I-II, t. 1 (1864). MILDE Bry. siles. 75 (1869).

Dicranodontium lutescens SCHIMP. MSS.= ♀

Dicranum Dickieanum WILS. MSS.

Dicranod. longirostre var. *β. aristatum* JURATZ. Laubm. Oesterr.-ung. 52 (1882).

Didymodon aristatus LINDB. Musc. scand. 25 (1879).

Dioicous; in lax soft tufts 2—3 in. high, yellow green above, pale brown or ferruginous below, with fine pale or rufous radicles at base; stem decumbent at base, very slender. Leaves remote and ovate-acuminate at base, becoming longer and closer upward, from an oblong-lanceolate concave base, continued into a long channelled subflexuose arista, with 6—10 ridges at back, serrulate at margin, the highest broader and more concave, with the margin from the middle of the base upward sharply toothed and incurved, the arista very long, secund arcuate, formed of the nerve which is sulcate and spinulose at back.

Nerve ½—¼ width of base; cells lax rectangular and pellucid at base, the angular large hyaline numerous, the upper chlorophyllose, the teeth hyaline. Perich. bracts like the leaves, very broad at base, sheathing; seta elongated yellow erect, twisting to the left when dry, capsule erect pale brown, cylindric-oval, contracted below the mouth, plicate when old, lid conic with a subulate nearly straight beak about as long as capsule; teeth pale red, cleft half way into two unequal legs.

Male infl. gemmaceous, inner bracts suddenly shortly acuminate, the nerve thin or scarce evident.

HAB.—On sandstone rocks in mountain districts; always sterile.

Lennox castle, Campsie and Ben Ledi (*McKinlay* 1861)!! Ben Mac Dhui (*Dickie* 1861)! Mains Castle, New Kilpatrick (*Galt* 1865)!! Ben Voirlich (*McKinlay* 1865)! Milngavie, Glasgow (*Stirton* 1864)! Bach-na-gairn, Clova (*Fergusson* 1868). Ben Hope, Sutherland (*Howse* 1871)!! Debris of rocks by Loch Avon, Braemar (*Hunt* 1871)!!

Very unsettled opinions have been held by bryologists with respect to this moss and the next, probably influenced to some extent by the fact that they frequently grow together, and that *D. asperulum* is variable in the roughness and direction of the leaves, so that some forms are difficult to discriminate, not only from *D. uncinatum*, but still more from *Didymodon denudatus*, which it closely resembles in structure. The clear definition of the species by Mr. Mitten in his Musci Indiæ or. drawn up from fertile specimens (with which the British plant is certainly identical), shows that however closely in habit and leaf-structure it resembles *Didym. denudatus*, it cannot be congeneric, for as a genus that must stand on the form of its peristomial teeth, but those of *D. asperulum* are perfectly dicranoid. We may contrast the species thus:—

D. asperulum. Dull green, stems slender scarcely tomentose, leaves dense, variously flexuose, erecto-patent, uppermost slightly falcato-secund, margin of basal wing serrated, subula closely serrated, scabrous at back.

D. uncinatum. Yellow green, rather glossy, stems robust tomentose, leaves more distant, all regularly falcato—or circinato—secund, margin of basal wing, entire, subula distantly denticulate in upper part, smooth at back.

Didym. denudatus. Known at once by its large basal auricles, with large lax hyaline cells.

An elaborate paper by Milde, "*Ueber Dicranodontium*," in Botan. Zeitung, 1870, pp. 392 and 414, is well worth consulting, although we differ from some of his conclusions.

21. DICRANUM UNCINATUM (*Harv.*) *C. Muell.*

Dioicous; tall glossy yellow-green; leaves strongly falcato-secund, from a dilated base, longly subulate, denticulate toward apex, cells at base lax quadrate, with a border becoming broader upward of very narrow elongated ones; caps. erect subcylindric, lid rostrate. (T. XXIV, C.)

SYN.—*Thysanomitrium uncinatum* HARVEY in HOOK. Ic. pl. rar. i, t. 22, f. 5 (1837), et Lond. Journ. Bot. ii, p. 6 (1840).

Dicranum uncinatum C. MUELL. Synops. i, 404 (1849). MITT. in Journ. Lin. Soc. i, Suppl. 21 (1859).

Dicranum circinatum WILS. Bry. brit. 76 (1855). SCHIMP. Bry. eur. Suppl. fasc. III-IV, t. 4 (1866). HOBK. Syn. br. m. 47 (1873).

Dicranodontium asperulum p.p. WILS. in Kew Journ. Bot. IX, 296 (1857).

Dicranodontium circinatum SCHIMP. Synops. 2 ed. 100 (1876).

Dicranum comptum SCHIMP. Synops. 2 ed. 97 (1876).

Dioicous; laxly cæspitose, glossy golden green or fulvous. Stem slender flexuose, 2—5 in. high, dichotomous, geniculato-ascending, more or less rufo-tomentose. Leaves rather distant, enlarging upward, lowest lanceolate, upper very long, secund circinate, from a decurrent sheathing base slightly inflated at the angles, suddenly longly subulate, canaliculate; nerve $\frac{1}{5}$ width of base, of 3 strata of cells, produced into a very long arista, denticulate at back and margin; cells at angles and mid-base large thin hyaline, hexagono-rectangular, marginal in 4—8 rows of very long narrow green cells. Perich. bracts from a laxly areolate, shortly sheathing base, gradually capillaceous, seta short, fulvous, straight or flexuose, caps. erect subcylindric, castaneous-brown, lid with a long beak, teeth purple, cleft half way, the legs subulate.

HAB.—Wet grassy places on mountains; sterile, not common.

Ben Voirlich by Loch Lomond (*Greville* 1825)!! Ben Mac Dhui (*Davies* 1861)!! Ben Nevis (*McKinlay* 1862)! Ben Challum, Perthshire, with *D. asperulum* (*McKinlay* 1863)!! Loch Maree (*Hunt* 1866)!! Glen Phee, Clova (*Fergusson* 1867)!!

The basal areolation is much firmer than in the last species, and the marginal border of very narrow cells much more distinct. Although Harvey placed the species in the genus *Thysanomitrium*, he must have done so at random, as the calyptra has never been described.

Subf. 5. *ONCOPHOREÆ*. Plants densely or laxly tufted; leaves chlorophyllose, opake, usually papillose, without enlarged basal angular cells, the upper cells minute, quadrate. Capsule oblong or subcylindric, frequently striate, usually with a strumose neck.

14. DICHODONTIUM SCHIMP.

Bry. eur. Coroll. p. 12 (1855).

Plants laxly tufted, soft. Leaves squarrose, crenato-serrate, papillose, opake, cells rectangular at base, quadrate above, chlorophyllose. Calyptra large, cucullate; capsule solid, pachydermous, smooth, lid rostrate, peristome large, teeth 16, cleft below the middle into 2—3 legs, closely trabeculate.

Inhabiting wet rocks and stones by streams.

Der.—διχαω to divide, οδους a tooth.

CLAVIS TO THE SPECIES.

Capsule cernuous, gibbose ovate; leaves serrulate at apex.	*pellucidum.*
Capsule erect, subcylindric; leaves serrated in upper half.	*flavescens.*

1. DICHODONTIUM PELLUCIDUM (*L.*) *Schimp.*

Dioicous; laxly tufted; leaves squarrose, flexuose, lineal-lanceolate, entire or crenulate at point, obtuse, papillose. Caps. cernuous, ovate, lid rostrate. (T. XXIV, D.)

SYN.—*Muscus polytrichoides angustifolius pellucidus ramosus.* PLUK. in RAY Synops. st. br. app. 241 (1690); Phytogr. 1, t. 49, fig. 1 (1691).

Bryum erectis capitulis subrotundis fuscis, fol. minoribus pellucidis rugosis DILL. in RAY Syn. 3 ed. 96 (1724); Var.

Bryum palustre pellucidum, capsulis et foliis brevibus recurvis DILL. Hist. Musc. 364, T. 46, f. 23 (1741); (excl. syn. et var. *ramosa.*) et Herb.

Bryum pellucidum L. Sp. plant. ii, 1118 (1753) p.p. et. excl. var. *β.* Syst. nat. ii, 701, Syst. veg. 948. HUDS. Fl. angl. 407 (1762). NECK. Meth. musc, 204 (1771). LIGHTF. Fl. scot. ii, 724 (1777). ABBOT Fl. Bedf. 237 (1798). HULL. Br. fl. P. 2, 264 (1799).

Dicranum pellucidum HEDW. Fund. musc. ii, 92 (1782). TIMM Pr. fl. megap. n. 786 (1788). ROTH op. c. 177, BRID. musc. rec. II, P. I, 176 (1798), Sp. Musc. I, 192 (1806), Mant. 62 (1819), Bry. univ. i, 439 (1826). SWARTZ Musc. suec. 35 (1799). ROEHL. Moosg. deutsch. 355 (1800), Deutsch. fl. iii, 69 (1813). HEDW. Sp. musc. 142 (1801). SMITH Fl. brit. iii, 1223 (1804), Eng. bot. t. 1346. TURN. Musc. hib. 68 (1804). P. BEAUV. Prodr. 54 (1805). WEB. MOHR Bot. Tasch. 183 (1807). SCHWAEG. Suppl. I, P. I, 181, t. 48 (1811). VOIT Musc. herbip. 49 (1812). MART. Fl. cr. erl. 103 (1817). Hook. Tayl. Musc. brit. 55, t. 17 (1818). GRAY Nat. arr. br. pl. i, 736 (1821). HOOK. Fl. scot. P. 2. 133 (1821), Br. fl. ii, 40 (1833). FUNCK Moost. 30, t. 21 (1821). ZENK. DIETR. Musc. thuring. II, n. 29 (1822). HUEBEN. musc. germ. 269 (1833). MACK. Fl. hib. P. 2, 23 (1836). DE NOT. Syll. musc. 208 (1838). HARTM. Skand. fl. BR. SCHIMP. Bry. eur. fasc. 37-40, p. 16, t. 4 (1847). RABENH. Deutsch. kr. fl. ii, S. 3, 138 (1848). WILS. Bry. brit. 67, t. 17 (1855). HUSN. Mouss. nord-ouest 48 (1873). HOBK. Syn. br. m. 41 (1873).

Mnium pellucens GMEL. Syst. nat. ii, 1328 (1791). LAICH. Pl. eur. 476 (1794). WITH. Bot. arr. br. veg. 3 ed. iii, 802 (1796).

Dicranum aquaticum EHRH. cr. exsic. n. 213 (1790). ROTH Fl. germ, iii, P. I, 177 (1800). BRID. Musc. rec. II, P. I, 158 (1798).

Bryum aquaticum HOFFM. Fl. germ. ii, n. 35 (1796).

Ångstroemia pellucida C. MUELL. Synops. ii, 606 (1851). JENS. Bry. dan. 99 (1856).

Dichodontium pellucidum SCHIMP. Bry. eur. Coroll. 12 (1855). Synops. 65 (1860), 2 ed. 66 (1876). BERK. Handb. br. m. 284 (1863). MILDE Bry. siles. 55 (1869). DE NOT. Epil. bri. ital. 489 (1869). LINDB. in Bot. Notiser 1878 p. 115, JURATZ. Laubm. oest.-ung. 28 (1882).

Tridontium pellucidum LINDB. in Oefv. vet. ak. förh. xxi, 230 (1864).

Didymodon Woodii SCHIMP. MSS.

Dioicous; in lax tufts 1—3 in. high, light green above, dull lurid green below. Stem flexuose, erect, sparingly branched with a long innovation at the perichætium, radiculose below. Leaves laxly imbricated, erecto-flexuose, appressed and twisted when dry, from an oblong sheathing pale pellucid base, squarroso-recurved, lineal-lanceolate, more or less obtuse and cucullate, canaliculate, slightly undulate at margin, entire or more or less serrated towards point, opake, papillose on both sides; nerve stout, vanishing at apex, crenulate at back near the point; cells at base elongated rectangular pellucid, above minute quadrate, deep green, strongly papillose at back. Perich. bracts like the leaves but more sheathing at base, seta stout, pale yellow, short rigid; caps. cernuous, pachydermous, gibbose-ovate or subglobose, subsymmetric, smooth, with scarce any neck, pale olive or reddish-brown, black when

old, not annulate; lid large convex conic, obliquely rostrate, orange; teeth large, 2—3-fid, blood-red, orange above, punctate-striolate below middle, papillose at apex.

Male pl. like the female, infl. terminal, gemmiform, bracts from a broad base very concave, broadly linear-subulate, nerve excurrent.

HAB.—Wet rocks and stones about the beds of streams and by waterfalls; not uncommon. Fr. 10—11.

This moss varies considerably in the form and size of the capsule and length of the lid, but in all the specimens that have come before us we have seen no transition to the next species. In habit it much resembles *Anisothecium squarrosum* which may always be distinguished by its smooth leaves and lax areolation. According to Lindberg the genus *Tridontium* belongs to Tortulaceæ, standing near *Scopelophila* MITT. (*Merceya* SCHIMP.)

Var. *β.* **fagimontanum** (*Brid.*)

Plants shorter more dense with shorter branches; leaves shorter, more obtuse, scarcely recurved; capsule smaller.

SYN.—*Dicranum pellucidum* var. *β. fagimontanum* BRID. Sp. musc. I, 192 (1806), Bry. univ. i, 441.

Dichod. pellucidum var. *β. fagimontanum* SCHIMP. et auct. cit.

HAB.—Similar localities in more alpine districts.

Ben Lawers (*Braithwaite* 1865)!! Sandstone rocks at Clifton Junction (*Holt* 1883)!!

Variable in density and height, sometimes only reaching half an inch, but readily distinguished by its short obtuse leaves.

2. DICHODONTIUM FLAVESCENS (*Dicks.*) *Lindb.*

Dioicous; laxly tufted, scarcely branched; leaves lineal-lanceolate, more distant, serrate in upper half, less obtuse. Caps. erect or a little inclined, cylindraceous, lid rostrate. (T. XXIV, E.)

SYN.—*Muscus polytrichoides elatior, foliis angustis pellucidis et fere membranaceis.* PLUK. in RAY Synops. app. 240 (1690); Phytog. i, t. 44, fig. 7 (1691), Almag. bot. 257 (1696).

Bryum erectum, capit. subrotundis fuscis; fol. minoribus pellucidis rugosis. DILL. in RAY Syn. 3 ed. 96 (1724), excl. var.

Bryum flavescens DICKS. Fasc. pl. cr. II, 4, t. 4, fig. 5 (1790). GMEL. Syst. nat. 13 ed. ii, P. 2, p. 1338 (1791). WITH. Bot. arr. Br. veg. 3 ed. iii, 830 (1796). HULL Br. Fl. P. 2, 254 (1799).

Bryum lineare DICKS. Fasc. III, 6, t. 8, fig. 2 (1793).

Dicranum flavescens TURN. Musc. hib. 70 (1804). SM. Fl. brit. iii, 1224 (1804), Eng. Bot. t. 2263. BRID. Sp. musc. I, 196 (1806), Mant. 63 (1819). HOOK. TAYL. Musc. brit. 98, t. 17 (excl. syn. W. M. Schwg. et Funck.) 1818. GRAY Nat. arr. br. pl. i, 736 (1821). HOOK. Fl. scot. P. 2, 132 (1821), Br. Fl. ii, 40 (1833). MACK. Fl. hib. p. 2, 22 (1836).

Dicr. gracilescens β. flavescens BRID. Bry. univ. i, 442 (1826). HUEBEN. Musc. germ. 255 (1833).

Dicr. pellucidum var. *γ. serratum* BR. SCHIMP. Bry. eur. fasc. 37—40, p. 16, t. 4 γ. (1847). WILS. Bry. brit. 68, t. 17 (1855). HOBK. Syn. br. m. 41 (1873).

Ångstrœmia pellucida var. *γ. serrata* C. MUELL. Synops. ii, 607 (1851).

Dichodontium pellucidum var. *γ. serratum* SCHIMP. Bry. eur. Coroll. 13 (1855), Synops. 66 (1860), 2 ed. 66 (1876). MILDE Bry. sil. 55 (1869). JURATZ. Laubm. Oesterr.-ung. 28 (1882).

Dichodontium flavescens LINDB. in Botan. notiser 1878, p. 113, et Musc. scand. 27 (1879).

Dioicous; laxly tufted, slightly branched, somewhat glossy, dull yellow green, resembling *D. pellucidum*. Leaves less crowded, longer flatter and narrower, gradually tapering to a more acute flat point, crenato-serrate in the upper half, basal cells more elongated, the quadrate ones forming a very slight border to the basal wing, and not coming so low down in the leaf, scarcely papillose. Capsule erect or slightly inclined, oblong, subcylindric, pale brown, contracted below the mouth when dry, lid with an oblique acute beak; peristome paler with longer teeth, not longitudinally punctate-striolate below middle, nor papillose at apex.

HAB.—On stones and gravel by banks of streams. Fr. 9.

Forfar (*Don* 1802). Bantry (*Miss Hutchins* 1809). R. Dargle (*Taylor* 1812). Collington (*Greville*). Appin (*Carmichael*). Nant-y-Flydd (*Wilson* 1833). Mill Dingle, High cliff, Rowsley and Matlock (*Wilson* 1834)! Bolton woods and Stanley Clough (*Nowell*)! By the Calder (*Gardiner* 1834). By the Esk and Wharfe, Yorks. (*Spruce* 1842)!! Hungershall rocks, Tunbridge Wells (*Mitten*). Thirsk and Wensleydale (*Baker* 1852)! Windermere (*Clowes* 1854)! Woodend (*Sidebotham* 1858)! Fin glen and Dunoon (*Hunt* 1865)!!

The leaves are less complicate than in the last species, the areolation laxer with the dorsal papillæ only mammosely protuberant.

Oreoweissia serrulata (Funck) Schimp. has been recorded by Dr. Stirton from Ben Lawers, but no specimens have come before us. Its head-quarters are the Italian alps and Austrian Tyrol.

ONCOPHORUS BRIDEL.

(Bryol. univ. i, 389 (1826)).

Plants in dense cushioned tufts, dichotomously branched. Leaves long, comant, crisped when dry, opake, with minute quadrate areolation, more or less papillose. Calyptra inflato-cucullate. Capsule erect or subincurved, oval or oblong, with a short neck, usually strumose, sometimes equal, striate, sulcate when dry, rarely smooth; teeth lanceolate, cleft into two unequal legs, or subulate, or more or less imperfect. Inhabiting mountain rocks.—Der. ογκος a swelling, φορεω to bear.

This expressive name *Oncophorus* was first mentioned by Bridel in his Mantissa, p. 53 (1819), as a section of *Dicranum* for all the strumose fruited species, and in his Bryologia established as a genus, including besides the principal species retained here, *Dicranella cerviculata* and *squarrosa*, *Dicranum Starkei*, *falcatum*, &c. In 1801 appeared *Cynontodium* Hedwig (altered by Bridel to *Cynodontium*) for the two species of *Swartzia* EHRH. but in 1846 Schimper renamed this genus *Distichium*, and transferred *Cynodontium* to *Dicranum Bruntoni*, and *Oncophorus* to Hampe's older genus *Leucobryum*, but in his Synopsis *C. gracilescens*, *polycarpum* and *virens* were added, and in 2 ed. *C. schisti* also, *C. Bruntoni* being moved into *Dicranoweisia*. The genus as now defined includes a number of closely allied species differing but little in habit and foliage, but presenting considerable variations in the peristome, by

which we are able to form several minor groups, one of which, *Rhabdoweissia*, deviates the most in its dwarf habit and small regular striated capsule. Besides the British species, *O. cirratus* (BRID.)—*alpestre* (WAHLENB.)—*brevipes* LINDB. *Martii* (HORNSCH.) and *schisti* (WAHLENB.) are also found in Europe.

CLAVIS TO THE SPECIES.

Capsule strumose.	
Capsule smooth; leaves smooth.	
Leaves lanceolate.	*virens.*
Leaves from a dilated base, suddenly subulate.	*Wahlenbergii.*
Capsule furrowed; leaves papillose.	*strumifer.*
Capsule not strumose.	
Capsule asymmetric, oblique.	
Leaves lanceolate, rather obtuse; perich. bracts short.	*gracilescens.*
Leaves lanc.-subulate, acute; perich. bracts longly subulate.	*polycarpus.*
Capsule symmetric, erect.	
Capsule smooth.	*Bruntoni.*
Capsule furrowed.	
Leaves obtuse; teeth of per. long, lanceolate.	*crispatus.*
Leaves acute; teeth of per. short, subulate.	*striatus.*

Sect. 1. LEIOCYSTIS *Lindb.*—Plants robust; leaves smooth. Capsule smooth, cernuous, incurved, teeth of peristome stout, trabeculate, cleft into two legs.

1. ONCOPHORUS VIRENS (*Sw.*) *Brid.*

Autoicous; in large lax tufts. Leaves lanceolate cuspidate, flexuose, nerved to apex, entire or serrate at point. Capsule ovate, subcylindric, incurved with a short strumose neck, smooth; peristome dicranoid. (T. XXV, B.)

SYN.—*Bryum virens* SWARTZ in Act. Upsal. 1784, p. 241.

Dicranum virens HEDW. Musc. fr. iii, 77, t. 32 (1792), Sp. musc. 142 (1801). ROTH Fl. germ. iii, P. I, 173 (1800). BRID. Musc. rec. II, P. I, 178 (1798), Sp. musc. I, 193 (1806), Mant. 54 excl. syn. WAHL. (1819). SWARTZ Musc. suec. 33 (1799). ROEHL. Moosg. deutsch. 379 (1800), Deutsch. fl. iii, 73 (1813). SMITH Fl. brit. iii, 1406 (1804), Eng. Bot. t. 1462. TURN. Fl. hib. 69 (1804). P. BEAUV. Prodr. 55 (1805). WEB. MOHR Bot. Tasch. 182 (1807). SCHWAEG. Suppl. I, P. I, 194 (1811). HOOK. TAYL. Musc. brit. 54, t. 17 (1818). GRAY Nat. arr. br. pl. i, 735 (1821). HOOK. Fl. scot. P. 2, 132 (1821). Br. Fl. ii, 38 (1833). FUNCK Moost. 31, t. 22 (1821). SCHULTZ in Syllog. Ratisb. 1828, p. 149. HUEBEN. Musc. germ. 231 (1833). DE NOT. Syll. 211 (1838), Epil. bri. ital. 625 (1869). Hartm. Skand. fl. FIOR. MAZZ. Bry. Rom. 2 ed. p. 17 (1841), BR. SCHIMP. Bry. eur. fasc. 37-40, p. 15, t. 3 (1847). RABEN. Deutsch. kr. fl. ii, S. 3, 137 (1848). WILS. Bry. br. 66, t. 17 (1855). HOBK. Syn. br. m. 40 (1873).

Oncophorus virens BRID. Bry. univ. i, 399 (1826). LINDB. Musc. scand. 27 (1879).

Ångstroemia virens C. MUELL. Synops ii, 609 (1851).

Cynodontium virens SCHIMP. Bry. eur. Coroll. 12 (1855), Synops. 63 (1860), 2 ed. 64 (1876). BERK. Handb. br. m. 285 (1863). JURATZ Laubm. oesterr-ung. 27 (1882).

Autoicous; in dense laxly cohering tufts, yellow green above, fuscous or black below; stem ascending 2—3 in. high, repeatedly dichotomous, fastigiate, slightly radiculose. Leaves erecto-patent flexuose, more or less crisped when dry, from an oblong semivaginant base, lanceolate cuspidate acute, subcomplicate-carinate, smooth, margin recurved, entire or serrate at apex, nerve subterete, vanishing at apex or very slightly excurrent, basal cells narrow pellucid, upper

minute quadrate. Inner perich. bracts sheathing to the middle, thence longly subulate and divaricate, seta rather short yellowish red; capsule subgibbose ovate, subcylindric, more or less incurved, with a short strumose neck abrupt on one side, when dry and empty smooth, contracted below mouth, ochraceous or fuscescent, lid conic rostrate, erose at base, oblique, orange, annulus narrow, persistent; peristome purple, rufous or orange, smooth, teeth broad robust, regular, cleft to middle. Male infl. minute, axillar in the comal leaves, bracts few, obovate-acuminate.

HAB.—Wet rocks and earth among stones by Alpine streams. Fr. 7. Common on Ben Lawers and all the Grampian range.

Var. β, **serratus** (*Schimp*).

Laxly tufted; stem tall ascending sparingly branched; leaves divaricato-patent, curling, the margin coarsely serrate. Caps. less strumose.

SYN.—*Dicr. virens* Var. γ. *serratum* SCHIMP. Bry. eur. *Cynodontium virens*. Var. γ. *serratum* SCHIMP. Coroll. &c.

HAB.—By mountain streams and waterfalls. North of England (*Prof. Barker* 1876).

This fine moss is a great ornament to mountain rocks, and varies much in size and in the form and direction of the fruit; the capsule is very fragile and splits with slight pressure.

2. ONCOPHORUS WAHLENBERGII *Brid.*

Autoicous; stem short nearly simple. Leaves lax, distant, from a broad sheathing base, suddenly linear, patent acute entire. Capsule obovate, when empty sulcate and incurved, strumulose; teeth of peristome approximate at base. (T. XXV, A.)

SYN.—*Dicranum virens* WAHLENB. Fl. lapp. 308 (1812), excl. syn.

Oncophorus Wahlenbergii BRID. Bry. univ. i, 400 (1826). LINDB. musc. scand. 27 (1879).

Dicranum Wahlenbergii SCHULTZ in Syllog. Ratisb. 1828, p. 149.

Dicr. virens Var. β. *Wahlenbergii* HUEBEN. Musc. germ. 231 (1833). BR. SCH. Bry. eur. fasc. 37—40, p. 15, t. 3 (1847). RABEN. Deutsch. kr. fl. ii, S. 3, 137 (1848).

Dicran. Richardsoni HOOK. in DRUMM. Musc. amer. n. 105.

Ångstroemia Wahlenbergii C. MUELL. Synops ii, 610 (1851).

Cynodontium virens Var. β. *Wahlenbergii* SCHIMP. Bry. eur. Coroll. 12 (1855), Synops. 63 (1860), 2 ed. 64 (1876). FERGUSS. in Scott. nat. 1879, p. 131. JURATZ. Laubm. oesterr. 28 (1882).

Autoicous; resembling *O. virens*, but the stems slender, 1—2 in. high and nearly simple. Leaves strongly crisped, distant, from a dilated sheathing base, narrowest below and widening upward, suddenly lanceolate-subulate, very patent and flexuose, the margin flat and involute above, obsoletely denticulate at apex or entire; areolation as in *O. virens*, the basal thinner and more elongated. Perich. bracts more widely sheathing, seta rufescent, capsule leptodermous, shorter,

castaneous or rufescent, obovate, cernuous, strumose, when empty incurved, wide mouthed, smooth or slightly sulcato-striate, lid with a curved beak, teeth of peristome purple, close together at the base, slightly cleft into two slender legs.

HAB.—Crevices of Alpine rocks; very rare. Fr. 8.
Glen Callater (*Fergusson* 1871).

Var. *β.* **compactus** (*Schimp*).

Plants in dense yellow green tufts; leaves dense erecto-patent, shorter, curling strongly, the margin quite entire. Capsule short gibbous, neck with a rounded struma. (T. XXV, B., fig. *β.*)

SYN.—*Dicranum Homanni* BOECK in HARTM. Skand. Fl. 4 ed. 384 (1843).
Dicr. virens Var. δ. *compactum* Bry. Eur.
Cynodontium virens Var. δ. *compactum* SCHIMP. Synops.
Dicr. Wahlenbergii Var. *β. compactum* LINDB. in Oefv. K. vet. ak. Förhandl. 1867, p. 556.

HAB.—On the higher mountains of Braemar. Little Craigandal, with *Dicr. elongatum* (*Fergusson and Roy* 1873).

This plant is certainly distinct from *O. virens*, and in habit resembles *O. strumiferum;* the form of the base of leaf is quite characteristic. Prof. Lindberg retains it in a separate section which he names *Parasymblepharis*. The variety *β.* by the shape of its leaf must also be placed here and not under *O. virens*.

Sect. 2. EUONCOPHORUS *Lindb.*—Plants slender, ramulose; leaves papillose. Capsule suberect, oblong, with a distinct neck, equal or slightly strumose, striate, when empty sulcate; teeth thin, more distantly trabeculate, cleft into 2—3 slender legs.

3. ONCOPHORUS STRUMIFER (*Ehrh.*) *Brid.*

Autoicous; in pulvinate tufts. Leaves lanceol.-subulate, flexuose, entire or crenulate at apex, papillose on both sides. Caps. gibbose-oblong, distinctly strumose at base. (T. XXV, C.)

SYN.—*Dicranum strumiferum* EHRH. Pl. crypt. n. 74 (1786). SCHRAD. Spic. fl. germ. 59 (1794). SWARTZ Musc. suec. 33 (1799). ROTH Fl. germ. iii, P. I, 186 (1800). SMITH Fl. brit. iii, 1228 (1804), Eng. bot. t. 2410. BRID. Sp. musc. I, 226 (1806), Mant. 24 (1819). WEB. MOHR Bot. Tasch. 181 (1807). SCHWAEG. Suppl. I, P. I, 194 (1811). ROEHL. Deutsch. fl. iii, 72 (1813). HOOK. TAYL. Musc. br. 54, t. 17 (1818). FUNCK Moost. 31, t. 21 (1821). GRAY Nat. arr. br. pl. i, 735 (1821). HOOK. Fl. scot. P. 2, 132 (1821), Br. fl. ii, 39 (1833). HUEBEN. musc. germ. 232 (1833). C. MUELL, Synops. ii, 592 (1851).

Fissidens strumifer HEDW. Musc. fr. ii, 88, t. 32 (1788). Sp. musc. 160 (1801). BRID. Musc. rec. II, P. I, 151 (1798). ROEHL. Moosg. deutsch. 308 (1800). WAHLENB. Fl. carp. 343 (1814).

Hypnum strumosum GMEL. Syst. nat. ii, 1339 (1791). LAICH. Pl. eur. 488 (1794).

Bryum strumiferum DICKS. Pl. crypt. fasc. 3, p. 8 (1793). WITH. Bot. arr. br. veg. 3 ed. iii, 833 (1796). HOFFM. Deutsch. fl. ii, 36 (1796). HULL Br. fl. P. 2, 264 (1799).

Bryum inclinans DICKS. op. c. fasc. 4, p. 11, t. 11, f. 9 (1801). SM. Fl. brit. iii, 1363. BRID. Musc. rec. II, P. III, 66 (1803), Sp. musc. III, 32 (1817), Mant. 120 (1819). SCHWAEG. Suppl. I, P. II, 120 (1816).

Cecalyphum strumiferum P. BEAUV. Prodr. 52 (1805).

Dicr. gibbosum BRID. Sp. musc. I, 225 (1806).

Oncophorus strumifer BRID. Bry. univ. i, 395 (1826). BRAITHW. in Journ. Bot. 1870, p. 228. LINDB. Musc. scand. 27 (1879).

Dicran. polycarpum Var. β. *strumiferum* DE NOT. Syll. 210 (1838). BR. SCH. Bry. eur. fasc. 37—40, p. 14 (1847). RABENH. Deutsch. kr. fl. ii, S. 3, 137 (1848). WILS. Bry. brit. 65, t. 17 (1855). HOBK. Syn. br. m. 40 (1873).

Cynodontium polycarpum Var. β. *strumiferum* SCHIMP. Bry. eur. Coroll. 15 (1855). Synops. 62. MILDE Bry. sil. 50 (1869). JURATZ. Laubm. oesterr.-ung. 27 (1882).

Cynodontium strumiferum DE. NOT. Epil. 280 (1869).

Autoicous; in cushioned yellow-green tufts. Stem 1—2 in. high, simple below, with ferruginous tomentum, subdichotomous and fastigiate above. Leaves from a broad sheathing base, lanceolate-subulate, flexuose and slightly twisting, strongly keeled, nerve vanishing at apex, margin revolute below, plane above, entire or crenulate at apex, surface in upper part covered with obtuse papillæ, as is also the back but finer; areolation as in *Onc. polycarpus* but smaller and denser. Perich. bracts sheathing, gradually subulate, seta reddish yellow; caps. gibbous-oblong, erecto-cernuous, with the base somewhat constricted and strumose, striate and yellow-green at first, finally sulcate and pale brown; annulus compound, lid red with a paler curved beak; teeth of per. red, adhering together at base, bifid.

HAB.—Wet crevices of rocks on the higher mountains. Fr. 8.

Glen Phee, Clova (*Hooker*) ! ! Holwick Scar, Teesdale, (*Spruce* 1843). Craig Koynack, Braemar (*Croall* 1854) ! Bach-na-Gairn (*Hunt* 1869) !

Although so generally united to *O. polycarpus*, this appears to be a good species, distinguished by the constant presence of a struma, and the leaves at their upper part papillose on both sides.

4. ONCOPHORUS GRACILESCENS (*Web. Mohr*) *Lindb.*

Autoicous; in small soft tufts. Leaves patent, tortuose, lanceolate, scarcely acuminate, rather obtuse, densely papillose on both sides. Caps. on a flexuose seta, erect, oblong, not strumose. (T. XXV, D.)

SYN.—*Dicranum gracilescens* WEB. MOHR Bot. Tasch, 184 (1807). SCHWAEG. Suppl. I, P. I, 180, t. 46 (1811). ROEHL. Deutsch. Fl. iii, 69 (1813). BRID. Mant. 62 (1819), Bri. univ. i, 441 (1826) excl. var. FUNCK Moost. 30, t. 21 (1821). HUEBEN. Musc. germ. 255 (1833). DE NOT. Syll. 209 (1838). BR. SCHIMP. Bry. eur. fasc. 37—40, p. 13, t. 11 (1847). RABENH. Deutsch. kr. fl. ii, s. 3, 136 (1848).

Campylopus cirrhatus BRID. Bry. univ. i, 479.

Dryptodon Campylopus BRID. Bry. univ. i, suppl. 773.

Dicranum mixtum DE NOT. Mant. n. 52; Syllab. 210.

Dicr. polycarpum β. *gracilescens* C. MUELL. Synops. ii, 591 (1851).

Cynodontium gracilescens SCHIMP. Bry eur. Coroll. 12 (1855), Synops. 61 (1860), 2 ed. 62 (1876). MILDE Bry. siles. 51 (1869). DE NOT. Epil. bri. ital. 281 (1869). JURATZ. Laubm. oesterr.-ung. 25 (1882).

Oncophorus gracilescens LINDB. Musc. scand. 27 (1879).

Autoicous; in small soft tufts, yellow green above, fuscous below, slender fastigiate-branched. Leaves flexuose patent, curved and twisted when dry, lineal-lanceolate or broadly lanc. rather obtuse or pointed, carinate, with the margin recurved, minutely crenulate, densely papillose

on both sides, papillæ longish; nerve thin, vanishing below apex, cells very small, roundish-quadrate, the basal elongated, diaphanous. Capsule pale becoming brownish, on a flexuose pale pedicel, erect or subcernuous, oval and oblong, striate, the neck inconspicuous, not strumose; lid long beaked, smooth at margin, annulus persistent, of 2 rows of cells; teeth 2—rarely 3—fid below middle, rufous red, remotely articulate.

HAB.—Fissures of alpine rocks; very rare. Fr. 8.

Glen Phee, Clova (*Fergusson* 1868).

This was sent as *O. polycarpus* by the Rev. Mr. Fergusson, as well as true specimens of that plant, and hence it is probable that they grew together, and at first sight it is not an easy matter to discriminate them. Perhaps the distinction will be best apprehended by a comparison of the figures of the leaves and bracts, and of their apices and areolation. *O. polycarpus* has the leaves papillose only on the back towards apex, while in *O. gracilescens* both surfaces are distinctly so. It will doubtless be met with in other places now that attention is drawn to it.

5. ONCOPHORUS POLYCARPUS (*Ehrh.*) *Brid.*

Autoicous; cæspitose. Leaves crowded, flexuose, lanceolate-subulate, acute, faintly papillose, denticulate at point. Caps. erect, oblong, not strumose, with a tapering neck. (T. XXV, E.)

SYN.—*Dicranum polycarpum* EHRH. Pl. crypt. exs. n. 84 (1786). ROTH Fl. germ. iii, P. I, 187 (1800). SWARTZ Musc. suec. 32 (1799). Smith Fl. brit. iii, 1227 (1804), Eng. Bot. t. 2269. BRID. Sp. musc. I, 102 (1806), Mant. 66 (1819), Bry. univ. i, 397 (1826). WEB. MOHR Bot. Tasch. 179 (1807). SCHWAEG Suppl. I, P. I, 179 (1811). VOIT Musc. herbip. 30 (1812). MART. Fl. cr. erl. 102 (1817). HOOK. TAYL. Musc. brit. 57, t. 18, p.p. (1818). FUNCK Moost. 29, t. 20 (1821). HOOK. Fl. scot. P. 2, 133 (1821), Br. fl. ii, 39 (1833). GRAY Nat. arr. br. pl. i, 737 (1821). HUEBEN. Musc. germ. 253 (1833). DE NOT. Syllab. 210 (1838). HARTM. Skand. Fl. BR. SCH. Bry. eur. fasc. 37—40, p. 14, t. 2 (1847). RABENH. Deutsch. kr. fl. ii, S. 3, 137 (1848). C. MUELL. Synops ii, 591 (1851). WILS. Bry. brit. 65, t. 18 (1855).

Bryum medium VILL. Pl. Dauph. iii, 878 (1786).

Fissidens polycarpos HEDW. Musc. frond. ii, 85, t. 31 (1788), Sp. musc. 159 (1801). BRID. Musc. rec. II, P. I, 150 (1798). ROEHL. Moosg. Deutsch. 305 (1800). WAHLENB. Fl. carp. 343 (1814).!

Bryum polycarpon HOFFM. Deutsch. fl. ii, 37 (1796).

Cecalyphum multiflorum P. BEAUV. Prodr. 51 (1805).

Oncophorus polycarpus BRID. Bry. univ. i, 397 (1826).

Cynodontium polycarpum SCHIMP. Bry. eur. Coroll 12 (1855), Synops. 62 (1860), 2 ed. 63 MILDE Bry. siles, 50 (1869). DE NOT. Epil. bri. ital. 280 (1869). JURATZ. Laubm. oesterr.-ung. 27 (1882).

Didymodon Jenneri SCHIMP. MSS. HOWIE in Trans. Edinb. Bot. Soc. ix, 198 (1868).

Autoicous; more robust 1—2 in. high, radiculose, pale green above, fuscous at base. Leaves crowded, gradually larger upward, flexuoso-patent, less crisped when dry, longer, from an oblong base, narrowly lineal-lanceolate-subulate, acute, serrulate at apex, less papillose, nerve lost at apex, margin recurved, serrate at point; basal cells elongated

rectangular, upper quadrate. Perich. bracts from an oblong sheathing base, longly subulate, seta straight, reddish yellow; caps. erect or cernuous, oblong-ovate, equal, with a short equal neck, deeply sulcate when dry, pale brown, annulus of 3 rows of large cells, lid conoid-rostellate, shorter than caps. crenulate at margin, teeth cleft to middle into 2 unequal legs, red.

Male infl. gemmiform, at base of perichætium, bracts few, ovate.

HAB.—Clefts of mountain rocks. Fr. 7.

Ben High (*Don*). Cader Idris (*Ralfs*). Bushiel Dene (*Hardy*). Hambledon Dene (*Johnston*). Dumyet, Ochills (*Wilson* 1855)!! Ben Chonzie, Perth—Glen Turritt and Glen Esk (*Croall* 1854). Glen Tilt, Trossachs and Ben Lawers (*McKinlay* 1861). Craig Maid and Carlowie (*Gardiner* 1843)! Castleton, Braemar (*Black* 1854). Rydal (*Borrer* 1845). Clova (*Fergusson*)!!

Much confusion has existed between this species and *O. Bruntoni*, partly due to Hedwig's figure of *O. polycarpus* representing the capsule as smooth; in habit they closely approximate, but the leaves of *O. polycarpus* are longer, and the longer striated caps. and well developed peristome at once distinguish it.

Sect. 3. PHEUGODON *Lindb.* Caps. leptodermous, regular, not strumose, faintly ribbed when dry, peristome small and imperfect.

6. ONCOPHORUS BRUNTONI (*Smith*), *Lindb.*

Autoicous; pulvinate, fasciculate-leaved. Leaves lineal-lanceolate, remotely denticulate at point, papillose. Capsule erect, oval-oblong, symmetric, smooth; lid rostrate; teeth small, irregular, cleft to base, the legs erose or entire. (T. XXVI, A.)

SYN.—*Grimmia cirrata* SM. Fl. brit. iii, 1189 (1804), Eng. Bot. t. 2356.

Dicranum Bruntoni SM. Eng. Bot. t. 2509 (1812). C. MUELL. Synops. ii, 590 (1851). JENS. Bry. dan. 93 (1856). HUSN. Mouss. nord-ouest. 47 (1873).

Didymodon obscurus KAULF. in STURM Deutsch. fl. II, heft. 16, n. 9 (1815). BRID. Mant. 103 (1819), Bry. univ. i, 516 (1826). FUNCK Moost. t. 14 (1821). SCHWAEG. Suppl. II, P. I, 80, t. 124 (1823). GREV. Scott. cr. fl. iv, t. 193 (1826). SPRENG. in L. Syst. veg. iv, P. I, 173 (1827). DUBY Bot. gall. ii, 566 (1830). HUEBEN. Musc. germ. 289 (1833).

Dicranum polycarpum HOOK. TAYL. Musc. br. 57, t. 18 p.p. (1818). HOOK. Fl. scot. P. 2, 133 (1821). GREV. Fl. edin. 240 (1824).

Didymodon Bruntoni WALK.-ARN. Disp. musc. 36 (1825). HOOK. TAYL. Musc. br. 2 ed. 117, t. suppl. 4 (1827). HOOK. Br. fl. ii, 29 (1833). MACK. Fl. hib. P. 2, 18 (1836).

Weissia cirrata BALS. DE NOT. Prodr. fl. mediol. 142 (1834).

Trichostomum obscurum DE NOT. Syllab. 194 (1838).

Cynodontium Bruntoni BR. SCH. Bry. eur. fasc. 33—36, p. 3, t. 1 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 128 (1848). WILS. Bry. brit. 61, t. 34 (1855). SCHIMP. Synops. 60 (1860). BERK. Handb. br. m. 284, t. 23, fig. 9 (1863). HOBK. Syn. br. m. 39 (1873). JURATZ. Laubm. oesterr-ung. 25 (1882).

Weissia Bruntoni DE NOT. Epil. bri. ital. 597 (1869).

Oreoweisia Bruntoni MILDE Bry. siles. 54 (1869).

Dicranoweisia Bruntoni SCHIMP. Synops. 2 ed. 56 (1876).

Autoicous; in soft yellowish or olive green cushioned tufts, with ferruginous radicles at base, fastigiate branched. Leaves crowded,

fasciculate, erecto-patent, when dry cirrate-contorted, lower elongato-lanc. upper much longer, lineal-lanc. flexuose, carinate, concave with the margin recurved, remotely denticulate toward apex, minutely papillose, nerve vanishing in apex, roughish at back; basal cells rather lax, elongate hexagonal, the angular flat, pellucid, upper quadrate opake, chlorophyllose. Perich. bracts semivaginant at base, shortly acuminate, caps. on a short yellowish seta, erect, regular or a little curved on one side, oval-oblong, rarely elongated, leptodermous, smooth, pale brown, when dry faintly plicate; annulus narrow, adherent, lid conic, obliquely rostrate, orange at base, not half length of caps., teeth small red, irregular, cleft to base, the legs erose and partly cohering, or entire and free, smooth, indistinctly striolate.

Male infl. gemmaceous, at base of perich., bracts few, broadly ovate obtusely acuminate; antheridia and paraphyses elongated.

HAB.—Clefts of rocks in subalpine districts. Fr. 7—8.

Ben Lawers (*Don*). Pentland hills (*Greville*). Appin and Lorne (*Carmichael*). Powerscourt (*Taylor*). Aber (*Wilson*)!! Capel Curig (*Borrer* 1838)! Newburgh, Fife (*Howie* 1864)! Seven Churches (*Moore*). Glenbower and Kildorney, Cork (*Carroll*). Oldcambus and Hambledon denes (*Hardy*). Dartmoor (*Holmes*). Newtondale and Teesdale (*Spruce* 1843)! Craig-an-darrach, Ballater (*Hunt* 1871)!!

Although much resembling *O. polycarpus*, the present species may be distinguished by its shorter leaves, shorter smooth capsule, and especially by its ill-developed peristome.

O. schisti (WAHLENB.) may possibly be found here, as it occurs in Sweden and Norway; it is still smaller and denser than *O. Bruntoni*, with rather obtuse nearly entire leaves, and a striated capsule with lanceolate undivided teeth.

Sect. 4. RHABDOWEISSIA (*Br. Sch.*) *Lindb.* Plants short, densely tufted, leaves narrow, curled, finely papillose in upper part. Caps. symmetric, not strumose, wide mouthed, 8-striate, when dry 8-sulcate, teeth subulate.

7. ONCOPHORUS CRISPATUS (*Dicks.*) *Lindb.*

Autoicous; leaves flexuose, curled, linear-lanceolate, coarsely toothed at the rather obtuse point. Caps. ovato-globose with a distinct neck, teeth lanceolate, persistent. (T. XXVI, B.)

SYN.—*Bryum crispatum* DICKS. Pl. crypt. Fasc. III, 3, t. 7, fig. 4 (1793). WITH. Bot. arr. br. veg. 3 ed. iii, 833 (1796). HULL Br. fl. P. 2, 264 (1799).

Weissia crispata BRID. Musc. rec. II, P. I, 73 (1798). ROEHL. Moosg. deut. 151 (1800).

Weissia denticulata BRID. Sp. musc. I, 108 (1806), Mant. 40 (1819), Bry. univ. i, 342 (1826). SCHWAEG. Suppl. I, P. I, 75, t. 19 (1811). FUNCK Moost. 15, t. 10 (1821). NEES HSCH. Bry. germ. ii, P. II, 78, t. 31, fig. 18 (1831). HUEBEN. Musc. germ. 135 (1833). HARTM. Skand. Fl. C. MUELL. Synops. i, 650 (1849). SCHIMP. Synops. 53 (1860).

Weissia fugax β. ROEHL. Deutsch. fl. iii, 49 (1813).

Weissia striata β. *major* HOOK. TAYL. Musc. br. 45, t. 15 (1818). GRAY Nat. arr. br. pl. i, 730 (1821). HOOK. Br. fl. ii, 21 (1833).

Rhabdoweisia denticulata BR. SCH. Bry. eur. fasc. 33—36, p. 5, t. 2 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 129 (1848). WILS. Bry. br. 51, t. 15 (1855). BERK. Handb. br. m. 291, t. 24, fig. 5 (1863). MILDE Bry. siles. 47 (1869). DE NOT. Epil. bri. ital. 283 (1869). HOBK. Syn. br. m. 36 (1873). SCHIMP. Synops. 2 ed. 59 (1876). JURATZ. Laubm. oesterr.-ung. 22 (1882).

Autoicous; in small lax bright-green tufts, fuscous at base. Leaves gradually longer upward, flexuoso—and recurvo—patulous, when dry cirrate—crispate, slightly glossy, broadly linear, obtuse, carinate, nerve vanishing below apex, margin plane or waved, coarsely and remotely toothed toward apex; cells elongato-hexagonal and hyaline at base; quadrato-hexag. and chlorophyllose above. Caps. erect, ovato-globose with a more distinct neck, more solid, fuscescent, when dry and empty, from a contracted base suburceolate, deeply sulcate; lid with a subulate beak, long as caps., teeth from a lanceolate base, narrowly subulate-linear, articulated, longer, more solid, rufous-purple, persistent.

HAB.—Crevices of subalpine rocks. Fr. 6—7.

On the Isla, Angus (*Hooker*). Green's Clough, Todmorden (*Nowell* 1856)!! Grasmere and Rydal (*Whalley* 1864)! Ben Voirlich, Craig Challeach and Glen Lyon (*Hunt* 1865)!! Hill bell, Westmoreland (*Stabler* 1868)! Cader Idris (*Wild* 1877)! Aber and Beddgelert (*Hunt* 1865)!! Glenmalur and Upper Lough Bray (*Moore*). Nire Lakes, Waterford (*Nicholson* 1882)!! Teesdale (*R. Barnes* 1881)!!

More robust than the next species and readily distinguished from it by the broad pointed, coarsely serrate leaves, and stout persistent peristome.

8. ONCOPHORUS STRIATUS (*Schrad.*) *Lindb.*

Autoicous; leaves curled, narrow lineal-lanceolate, scarcely toothed at the acute point. Caps. small ovate, teeth broad at base, suddenly subulate, slender and fugacious. (T. XXVI, C.)

SYN.—*Grimmia striata* SCHRAD. Bot. Journ. ii, 55 (1799). SMITH Fl. brit iii, 1185 (1804), Eng. Bot. t. 1988. WEB. MOHR Bot. Tasch. 143 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 59, t. 25 (1810). VOIT Musc. herbip. 33 (1812).

Grimmia crispata ROTH Fl. germ. iii, P. I, 145 (1800).

Weissia fugax HEDW. Sp. musc. 64, t. 13, fig. 5—10 (1801). BRID. Sp. musc. I, 107 (1806), Mant. 40 (1819), Bry. univ. I, 340 (1826). SCHWAEG. Suppl. I, P. I, 77 (1811). WAHLENB. Fl. lap. 324 (1812). ROEHL. Deutsch. fl. iii, 49 (1813), Ann. Wett. ges. iii, 100. FUNCK Moost. 15 t. 10 (1821). NEES HSCH. Bry. germ. ii, P. II, 74, t. 31, fig. 17 (1831). HUEBEN. Musc. germ. 133 (1833). HARTM. Skand. fl. DE NOT. Syllab. 234 (1838). C. MUELL. Synops. i, 649 (1849). SCHIMP. Synops. 52 (1860). HUSN. M. nord-ouest 42 (1873).

Weissia striata KAULF. in STURM Deutsch. fl. II, heft 16, t. 24 (1815). HOOK. TAYL. Musc. br. 45, t. 15 (1818). GRAY Nat. arr. br. pl. i, 730 (1821). HOOK. Fl. scot. P. 2, 130 (1821), Br. fl. ii, 21 (1833).

Weissia pumila BRID. Bry. univ. i, 338 (1826).

Weissia leptodon PLAUB. in BRID. op. c. p. 341, t. suppl. 1.

Rhabdoweisia fugax BR. SCH. Bry. eur. fasc. 33—36, p. 4, t. 1 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 129 (1848). WILS. Bry. br. 50, t. 15 (1855). BERK. Handb. br. m. 290 (1863). MILDE Bry. siles. 47 (1869). DE NOT. Epil. bri. ital. 283 (1869). HOBK. syn. br. m. 36 (1873). SCHIMP. Synops. 2 ed. 58 (1876). JURATZ. Laubm. oesterr.-ung. 21 (1882).

Autoicous; in small cushioned tufts, deep green above, pale fuscous and radiculose below. Leaves fasciculate, curled when dry, narrowly

lineal-lanc., gradually acuminate, acute, indistinctly denticulate or entire at apex, carinate, plane at margin, cells at base elongato-rectangular, pellucid, above quadrate or roundish, chlorophyllose; nerve vanishing in the apex. Perich. bracts like the leaves; caps. on a rather short pale seta twisted to left when dry, very small, erect, ovate, short-necked, pale ferruginous, deeply striate; annulus very narrow, persistent, lid broadly conic with a curved subulate beak; teeth from a very broad base, suddenly subulate, erect when moist, incurved when dry, rufous red, very fugacious.

Male infl. minute, near the female, bracts resembling the leaves.

HAB.—Fissures of rocks in subalpine districts. Fr. 6—7.

Devonshire, Wales, Ireland, N. of England and Scotland.

This little plant is only about a quarter of an inch high, yet its small yellow green tufts when loaded with capsules are conspicuous in the rock crevices of most of our mountains. The peristome is so fragile that it usually disappears as soon as the lid falls off.

CERATODON BRIDEL.

(Bry. univ. i, 480—1826.)

Plants cæspitant, terrestrial; leaves lanceolate, nerved, minutely areolate, smooth. Calyptra cucullate, rostrate. Capsule ovate-oblong, striate, sulcate when dry, with a more or less prominent neck, annulate, pachydermous; teeth of peristome arising from a short basal membrane, 16, regular cleft nearly to base into two filiform legs, closely articulate below, becoming more remotely so upward and papillose. Der. κερας a horn, οδους a tooth, from resembling a goat's horn.

The genus *Ceratodon* links the Dicranaceæ to the Tortulaceæ, approaching the former by the genus *Oncophorus* in the leaf, capsule and peristome, the slender legs of the latter with increasing papillosity clearly indicating a transition to the latter family, strengthened still more by the habit, foliage and areolation. *C. corsicus* SCHIMP. is found in S. Europe, but *C. chloropus* BRID. is placed by Lindberg in a new genus *Cheilothela*, between *Swartzia* and *Ditrichum*.

CLAVIS TO THE SPECIES.

Nerve reaching apex. Caps. subcernuous, with a nodose neck.	*purpureus.*
Nerve excurrent. Caps. erect, with a short equal neck.	*conicus.*

1. CERATODON PURPUREUS (*L.*) *Brid.*

Dioicous; leaves oblong-lanceolate, margin entire, or slightly denticulate at point, nerve reaching apex. Capsule on a purple seta, subcernuous, oblong with a short unequal neck, substrumose and sulcate when dry. (T. XXVI, D.)

SYN.—*Muscus trichoides parvus foliis musci vulgaris, capitulis longis acutis.* DOODY in RAY Syn. app. 243 (1690).

Bryum parvum trichoides ramosum, erectis capitulis subfuscis in pediculis obscure rubris. DILL. Cat. Giss. 224 (1719), et in RAY Synops. 3 ed. 96 (1724).

Bryum perangustis fol. et caulic. fol. crebrioribus et circa sum. magis congestis, capit. erectis e surc. annot. egred. pediculis purpureis. DILL. Giss. 226; RAY Syn. 3 ed. 99.

Bryum parvum, surculis et setis geminatis. DILL. Hist. 385, t. 49, f. 50 (1741).

Bryum tenue stellatum, setis purpureis. DILL. Hist. 386, t. 49, f. 51.

Bryum polytrichoides palustre, setis longioribus rubris setaceis. DILL. Hist. 387, t. 49. f. 52.

Mnium purpureum L. Sp. pl. ii, 1111 (1753), Syst. nat. ii, 700. WITH. Bot. arr. Br. veg. 665 (1776). RELH. Fl. cant. 399 (1785). ABBOT Fl. bedf. 233 (1798).

Bryum Celsii L. op. c. ii, 1120. VILL. Pl. dauph. iii, 866 (1789). DICKS. fasc. III, 7.

Bryum purpureum HUDS. Fl. angl. 412 (1762). NECK. Meth, musc. 211 (1771). WEISS Cr. gött. 198 (1770). LIGHTF. Fl. scot. ii, 734 (1777). WEB. Spic. fl. goett. 101 (1778). HOFFM. Deutsch. fl. ii, 36 (1796). HULL Br. fl. P. 2, 254 (1799).

Dicranum purpureum HEDW. Fund. musc. ii, 92, t. 4, fig. 17 (1782), Sp. musc. 136, t. 36 (1801). ROTH Tent. fl. germ. i, 460 (1788). SIBTH. Fl. oxon. 281 (1794). BRID. Musc. rec. II, P. I, 178 (1798), Sp. musc. I, 215 (1806), Mant. 69 (1819). SWARTZ Musc. suec. 36 (1799). ROEHL. Moosg. deutsch. 360 (1800), Deutsch, fl. iii, 75 (1813). RICH. in MCHX. Fl. bor. amer. ii, 298 (1803). SM. Fl. brit. iii, 1217 (1804), Eng. bot. t. 2262. TURN. Musc. hib. 71 (1804). P. BEAUV. Prodr. 55 (1805). SCHULTZ Fl. starg. 300 (1806). WEB. MOHR Bot. Tasch. 199 (1807). SCHWAEG. Suppl. I, P. I, 216 (1811). VOIT Musc. herbip. 51 (1812). WAHLENB. Fl. carp. 346 (1814). MART. Fl. cr. erl. 104 (1817). FUNCK Moost. 30, t. 21 (1821). FICIN. Fl. Dresd. ii, 54 (1823).

Fuscina purpurea SCHRANK Bayers. fl. ii, 453 (1789).

Bryum bipartitum DICKS. fasc. II, 7, (1790). HOFFM. WITH.

Bryum tenue DICKS. fasc. III, 8.

Dicran. Celsii SWARTZ Suec. HEDW. Sp. musc. Eng. bot. t. 2418.

Bryum strictum DICKS. fasc. iv.

Bryum papillosum DICKS. ibid.

Dicr. intermedium & purpurascens HEDW. Sp. musc.

Dicr. bipartitum, SM. Fl. brit. Eng. bot. t. 2357. *Dicr. strictum* SM. Fl. brit.

Trichostomum papillosum SM. Fl. brit. 1238. Eng. bot. t. 2533.

Didymodon purpureus HOOK. TAYL. Musc. brit. 65, t. 20 (1818). GRAY Nat. arr. br. pl. i, 742 (1821). HOOK. Fl. scot. P. II, 135 (1821), Brit. fl. ii, 28 (1833). BALS. DE NOT. Prod. Bry. mediol. 124 (1834). MACK. Fl. hibern. P. 2, 17 (1836).

Cerotadon purpureus BRID. Bry. univ. i, 480 (1826). WALLR. Fl. cr. germ. i, 179 (1831). HUEBEN. Musc. germ. 276 (1833). Hartm. Skand. fl. BR. SCHIMP. Bry. eur. fasc. 29—30, p. 5, t. 1—2 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 134 (1848). C. MUELL. Syn. 646 (1849). WILS. Bry. brit. 84, t. 20 (1855). SCHIMP. Synops. 139 (1860), 2 ed. 135 (1876). BERK. Handb. br. m. 275, t. 23, fig. 5 (1863). MILDE Bry. siles. 130 (1869). DE NOT. Epil. bri. ital. 568 (1869). HOBK. Syn. br. m. 49 (1873). HUSN. Mouss. nord-ouest 70 (1873). JURATZ. Laubm. oesterr.-ung. 85 (1882).

Trichostomum purpureum DE NOT. Syllab. 189 (1838).

Dioicous; in wide-spreading patches, olivaceous-green, often with a rufous or fuscous tint. Stems dichotomous, ¼—3 in. long, fastigiate, radiculose below. Leaves erecto-patent, laxly imbricated, incurved and somewhat twisting when dry, oblongo-lanc., subcomplicate-concave, margin revolute, becoming plane at apex, entire or slightly denticulate at point; nerve lost at apex or forming a cuspidate point; cells at base pellucid, elongate, 4—5 angled, above rounded-quadrate, nearly smooth, obscure and chlorophyllose. Perich. bracts longer, the innermost longly convolute-vaginant, sinuate above, and often suddenly acuminate and crenulate at apex. Caps. on a long purple shining seta, inclined, oblong, turgescent, straight or a little curved, purple or rufo-

fuscous, sulcate when dry and empty, strumulose, horizontal, incurved, 4—5 angled; annulus large, compound, rolling back, lid conic, slightly oblique, polished; teeth of per. purple in lower half, the legs equal, conjoined at base by the united articulations, bordered from base to middle by the pale projecting inner lamina.

Male plants more slender, infl. gemmaceous, outer bracts broadly ovate, acuminate, with a thick nerve, inner broadly convolute, obtuse, entire, obsolete-nerved.

HAB.—Gravelly soil on heaths, banks, walls and rocks; everywhere. Fr. 4—5.

The polymorphous character of this plant may be assumed from its lengthy synonymy, and so endless are the forms that we cannot even define stable varieties; one of the most marked is a robust livid-green one, 1—2 in. high, with broad leaves, found on several of the Scotch mountains, and also by Mr. Holt on banks near the sea in the Isle of Man. We would advise all commencing bryologists to study every part of this moss well, as its structure once familiarized to the eye will save much after trouble, and the beautiful peristome must attract every microscopist.

2. CERATODON CONICUS (*Hampe*) *Lindb.*

Dioicous; leaves ovato-lanc. narrower at base, margin entire, revolute throughout, nerve longly excurrent. Capsule on a paler seta, erect, symmetric, faintly sulcate when empty. (T. XXVI, E.)

SYN.—*Trichostomum conicum* HAMPE in litt. C. MUELL. Synops. i, 575 (1849).
Ceratodon conicus LINDB. Musc. scand. 37 (1879).

Dioicous; cæspitose, dull yellow-green above, fuscous below; stems short, rather slender dichotomously branched. Leaves erecto-appressed, deep green, smooth, crowded at top into a small closed coma, straight wet or dry, rather broadly ovato-lanceolate, margin quite entire, revolute to apex, nerve thick, excurrent in a long point; cells all small, regularly quadrate, the basal larger and pellucid. Perich. bracts convolute-vaginant, obtusate, with an excurrent nerve, laxly areolate. Caps. on a pale red seta, erect, ovate-elliptic, rather wide, fuscous, when dry and empty but little altered, sulcate in upper part, not strumulose; lid purple, conic short, obtuse straight; teeth pale, red at base, yellowish above, erect, with fewer articulations, scarcely bordered externally.

HAB.—Walls and waste ground, rare. Fr. 5.

On the coast near Newhaven (*Spruce* 1845)!! Ireland (*Mr. D. Orr*). Both sterile.

It is probable that this moss is not unfrequent on our south coasts, but has been overlooked for the common species in the absence of fruit; this was first found by Schlotheuber in May, 1847, on walls near Hochmühlen, in Hanover, and our figures are taken from original specimens.

SÆLANIA LINDB.

Utk. till en nat. grupp. af Eur. bladm. med topps. frukt, 35 (1878).

Plants cæspitant; leaves lanceolate, minutely areolate, serrated, smooth, covered at back with a glaucous granular-filamentose excretion. Calyptra cucullate. Capsule subcylindric, erect, leptodermous, slightly plicate when dry; teeth of peristome from a very narrow basal membrane, 16, irregular, cleft to base into two non-trabeculate, nodose, papillose legs, separate or joined here and there at the nodes.—Der. after Sælan, a Scandinavian bryologist.

1. SÆLANIA CÆSIA (*Vill.*) *Lindb.*

Autoicous; leaves lanceolate, acuminate, glaucescent, serrate toward apex. Caps. oval-oblong, pale brown, plicate when empty, lid conic. (T. XXVI, F.)

SYN.—*Bryum cæsium* VILLARS Pl. Dauph. iii, 879 (1789). BRID. Musc. rec. II, P. III, 49 (1803).

Trichostomum glaucescens HEDW. Musc. frond. iii, 91, t. 37 B (1792), Sp. musc. 112 (1801). BRID. Musc. rec. II, P. I, 123 (1798), Sp. musc. I, 235 (1806), Mant. 85 (1819). SWARTZ Musc. suec. 30 (1799). SM. Fl. brit. iii. 1245 (1804), Eng. bot. t. 2381. SCHWAEG. Suppl. I. P. I, 125 (1811). WAHLENB. Fl. lapp. 331 (1812), Fl. carpat. 341 (1814). FUNCK Moost. 25, t. 17 (1821). DE NOT. Syllab. 194 (1838), Epil. bri. ital. 510 (1869). BR. SCHIMP. Bry. eur. fasc. 18—20, p. 18, t. 15 (1843). RABEN. Deutsch, kr. fl. ii, S. 3, 117 (1848). C. MUELL. Synops, I, 569 (1849). WILS. Bry. brit. 118, t. 33 (1855). HOBK. Syn. br. m. 63 (1873).

Bryum glaucescens DICKS. Crypt. fasc. IV, 10 (1801).

Didymodon glaucescens WEB. MOHR Bot. Tasch. 158 (1807). SCHKUHR Deutsch. kr. gew. P. II, 67, t. 30 (1810). ROEHL. Deutsch. fl. iii, 57 (1813). GREV. Scott. cr. fl. iii, t. 127 (1825). BRID. Bry. univ. i, 513 (1826). HOOK. TAYL. Musc. br. 2 ed. 116, t. suppl. 3 (1827). HOOK. Br. fl. ii, 29 (1833).

Didymodon æruginosus HOOK. Mss. BRID. Bry. univ. i, 516.

Leptotrichum glaucescens HAMPE in Linnæa XX, 74 (1846). Schimp. Synops. 146 (1860), 2 ed. 145 (1876). BERK. Handb. br. m. 263 (1863). MILDE Bry. siles. 138 (1869). JURATZ. Laubm. oesterr.—ung. 82 (1882).

Ditrichum glaucescens HAMPE in Flora 1867, p. 182.

Sælania cæsia LINDB. l.c. et Musc. scand. 28 (1879).

Autoicous; densely cæspitose, about ½—¾ in. high, erect, very slender, much branched, fastigiate, yellowish-green above, and glaucescent from a mealy production on the leaves, ferruginous and somewhat radiculose below. Leaves minute and distant below, comose and erecto-patent above, somewhat twisting at point, smooth, from a lanceolate base, lineal-subulate, acute, carinate, margin erect, serrated at apex, nerve lost in the point; all the cells quadrato-rectangular, firm, chlorophyllose. Perich. bracts not vaginant, resembling the leaves but longer and more laxly areolate, the margin of two layers of cells; caps. on a yellowish-red seta, erect, oval-oblong, subcylindraceous, olivaceous, finally pale fuscous, leptodermous, irregularly plicate when empty; annulus compound; lid conico-rostellate, pale red, suboblique; teeth

deep purple, long, erect, very variable, papillose, the legs binate, more or less united at base or partly obsolete.

Male infl. gemmaceous, on short branches below the perichætia, bracts 3, broadly ovate, suddenly subulate, concave, patulous.

HAB.—Rocks covered with earth on the Highland mountains; rare. Fr. 7—8.

Glen Phee (*Drummond*)!! Clova (*Fergusson*)!!

Lindberg regards this moss as holding the same position in Oncophoreæ as *Ditrichum* does in Ditricheæ, from which its much closer affinity to *Ceratodon* necessarily separates it. It is a good example of a truly natural genus.

TAB. XIV. A. *Archidium alternifolium* (Todmorden, *Nowell*). B. *Pleuridium axillare* (Mere, *Hunt*). β. var. *strictum* (*Dickson*). C. *Pleur. subulatum* (Hampstead, *Braithwaite*). D. *Pleur. alternifolium* (Helsby, *Hunt*). E. *Ditrichum tenuifolium* (Finland, *Lindberg*). F. *Ditr. tortile* and β. var. *pusillum* (Castle Howard, *Black*). G. *Ditr. homomallum* (Sale, *Wilson*), β. var. *zonatum* (Clova, *Fergusson*). H. *Ditr. subulatum* (Saltash, *Holmes*).

TAB. XV. A. *Ditr. flexicaule* (A. Finland, *Lindberg*). c. & β. var. *densum* (Cheedale, *West*). B. *Swartzia montana* and β. var. *compacta* (Ben Lawers, *Braithwaite*). C. *Sw. inclinata* (Sands of Barrie, *Gardiner*). D. *Dicranella crispa* (Gale green, *Wilson*). E. *Dicr. secunda* (Gibson wood, *Nowell*). F. *Dicr. curvata* (Cwm Gafr, *Wilson*). G. *Dicr. heteromalla* (Chislehurst, *Braithwaite*), β. var. *stricta* (Inverness, *Croall*), γ. var. *interrupta* (Ardingly, *Davies*), δ. var. *sericea* (Alderley, *Hunt*).

TAB. XVI. A. *Dicr. cerviculata* (Levens, *Barnes*). B. *Anisothecium rubrum* and β. var. *tenuifolium* (Bangor, *Wilson*), δ. var. *callistomum* (Scotland, Dickson). C. *Anis. rufescens* (Ashley, *Hunt*). D. *Anis. Grevillei* (Glen Tilt, *Hooker*). E. *Anis. crispum* (Bowdon, *Hunt*), β. var. *elatum* (Stirrupwood, *Nowell*). F. *Anis. squarrosum* (Lawers, *Braithwaite*). G. *Seligeria Donii* (Castleton, *Whitehead*). H. *Sel. pusilla* (Levens, *Barnes*). I. *Sel. acutifolia* (Gotland, *Lindberg*), β. var. *longiseta* (Tideswell dale, *Whitehead*). K. *Sel. trifaria* (Litton, *Whitehead*).

TAB. XVII. A. *Sel. paucifolia* (Lewes, *Unwin*). B. *Sel. calcarea* (Shere, *Capron*). C. *Sel. setacea* (Greenfield, *Whitehead*). D. *Brachydontium trichodes* (Westward, *Wood*). E. *Blindia cæspiticia* (Ben Lawers, *Hunt*). F. *Bl. acuta* (Ben Ledi, *Braithwaite*). G. *Didymodon denudatus* (Skye, *Lawson*), β. var. *alpinus* (Lough Bray, *Moore*). H. *Dicranum asperulum* (Mains Castle, *Galt*). I. *Campylopus pyriformis* (Ightham, *Braithwaite*).

TAB. XVIII. A. *Campylopus fragilis* (Ben Ledi, *Braithwaite*). B. *Camp. subulatus* (Killarney, *Wilson*). C. *Camp. Schimperi* (Ben Lawers, *Braithwaite*). D. *Camp. Schwarzii* (Glencoe, *Hunt*). E. *Camp. setifolius* (Cromaglown, *Moore*). F. *Camp. flexuosus* (Glyder Vawr, *Wild*), β. var. *paludosus* (Loch Maree, *Boswell*). G. *Camp. paradoxus* (Wooler, *Hardy*).

TAB. XIX. A. *Camp. Shawii* and β. var. *hamatus* (N. Uist, *Shaw*). B. *Camp. atrovirens* (Killin, *Braithwaite*), β. var. *falcatus* (Connemara, *Barker*). C. *Camp. introflexus* (a. Oporto, *Newton*. b. Penzance, *Curnow*). D. *Camp. brevipilus* (Lewis, *Braithwaite*). E. *Dicranoweissia crispula* (Ben Lawers, *Braithwaite*). F. *Dicranow. cirrhata* (Levens, *Barnes*). G. *Dicranum fulvellum* (Scawfell, *Baker*).

TAB. XX. A. *Dicranum schisti* (Ben Lawers, *Braithwaite*). B. *Dicr. falcatum* (Ben Lawers, *Braithwaite*). C. *Dicr. Starkei* (Glen Callater, *Hunt*). D. *Dicr. molle* (Braemar, *Black*). E. *Dicr. majus* (Eskdale, *Braithwaite*).

TAB. XXI. A. *Dicr. scoparium* (Eskdale, *Braithwaite*), β. var. *alpestre* (Innisfallen, *Hunt*), γ. var. *recurvatum* (Godalming, *Mitten*), δ. var. *turfosum* (*Wesley*). B. *Dicr. Bonjeani* (Bowness, *Barnes*), β. var. *juniperifolium* (Blandford, *Boswell*), γ. var. *calcareum* (Woolstonbury, *Mitten*).

TAB. XXII. A. *Dicr. spurium* (Barmby Moor, *Spruce*). B. *Dicr. Bergeri* (Wybunbury Bog *Wilson*). C. *Dicr. congestum* (Lojo, Finland, *Lindberg*), β. var. *flexicaule* (Loch-na-Gar, *Black*). D. *Dicr. fuscescens* (Ben Lawers, *Braithwaite*), β. var. *falcifolium* (Dunoon, *Stirton*).

TAB. XXIII. A. *Dicr. elongatum* (a. Guldbransdalen, *Jensen;* c. Corrie Ardor, *Fergusson*). B. *Dicr. montanum* (a. Finland, *Lindberg*, c. Sutton Park, *Bagnall*). C. *Dicr. flagellare* (a. Tyrol, *Schliephacke*, c. Bostol wood, *Holmes*). D. *Dicr. viride* (a. Finland, *Lindberg*, c. Abbots Bromley, *Bloxam*). E. *Dicr. Scottii* (Plymouth, *Holmes*).

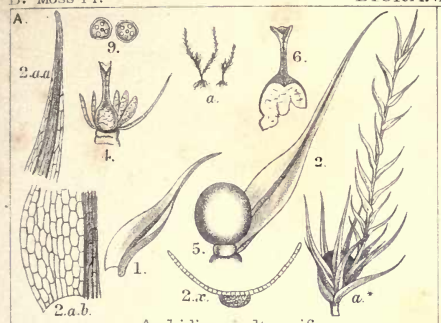
TAB. XXIV. A. *Dicr. Sauteri* (Tyrol, *Sauter*), β. var. *curvulum* (Braemar, *Black*). B. *Dicr. longifolium* (a. Finland, *Lindberg*, c. Ben Lawers, *Hunt*). C. *Dicr. uncinatum* (a. Nepal, *Wallich*, c. Ben Voirlich, *McKinlay*). D. *Dichodontium pellucidum* (Whitby, *Braithwaite*), β. var. *fagimontanum* (Ben Lawers, *Braithwaite*). E. *Dichod. flavescens* (Eskdale, *Braithwaite*).

TAB. XXV. A. *Oncophorus Wahlenbergii* (Krimml, *Davies*). B. β. ditto. var. *compactus* (Col di Stelvio, *Schimper*). B. *Onc. virens* (Clova, *Braithwaite*). C. *Onc. strumifer* (Glen Phee, *Hunt*). D. *Onc. gracilescens* (Glen Phee, *Fergusson*). E. *Onc. polycarpus* (Clova, *Fergusson*).

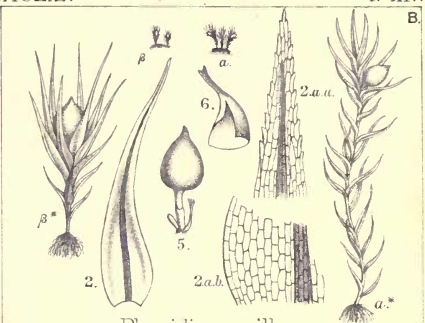
TAB. XXVI. A. *Onc. Bruntoni* (Ballater, *Hunt*). B. *Onc. crispatus* (Green's clough, *Nowell*). C. *Onc. striatus* (Penmaenmawr, *Braithwaite*). D. *Ceratodon purpureus* (Chislehurst, *Braithwaite*). E. *Cerat. conicus* (a. Hochmühlen, *Schlotheuber*, c. Newhaven, *Spruce*). F. *Sælania cæsia* (Glen Phee, *Fergusson*).

a. Fertile plant. a*. Ditto mag. b. Male. c. Sterile plant. 1. Leaf. mag. 1 x. Transv. section of leaf. 1 a. Apex of leaf. 1 aa, 1 ab. Areolation of apex and base. 2. Perich. bract. 2 x. Transv. section. 2 aa, 2 ab. Areolation of apex and base. 3. Male infl. 4. Bract, antheridia and paraphyses. 5. Capsule. 6. Calyptra. 7. Mouth of caps. and peristome. 8. Teeth of peristome. 9. Spores. 10. Annulus.

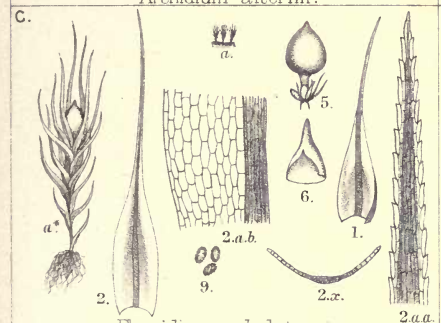
(Corrig. p. 91, for *Merceya* read *Metzleria*.)



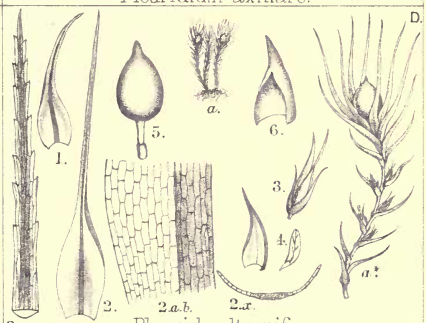
Archidium alternif.



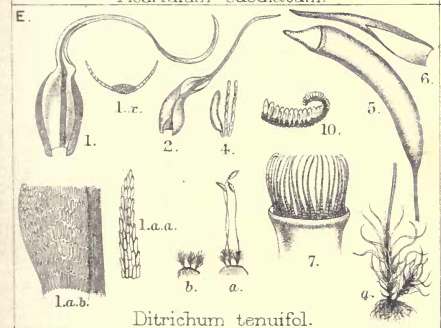
Pleuridium axillare.



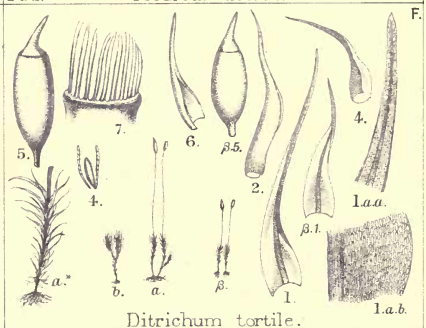
Pleuridium subulatum.



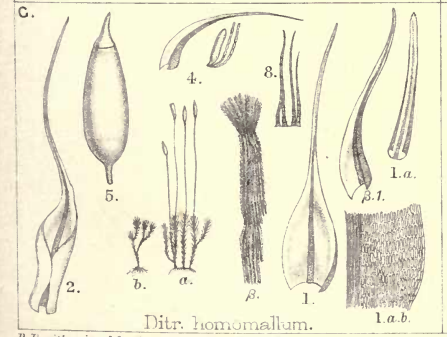
Pleurid. alternif.



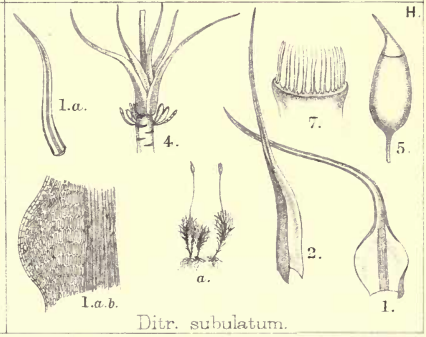
Ditrichum tenuifol.



Ditrichum tortile.

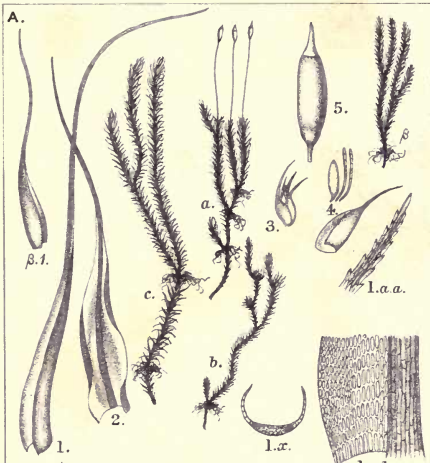


Ditr. homomallum.



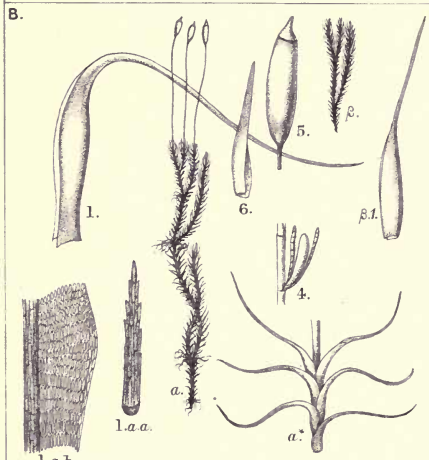
Ditr. subulatum.

A.



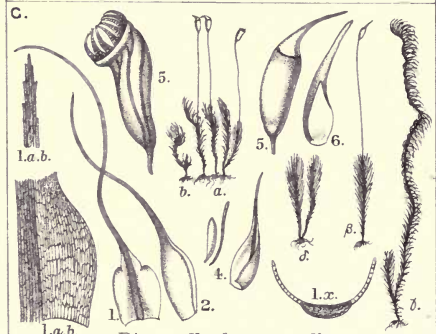
Ditrich. flexicaule.

B.



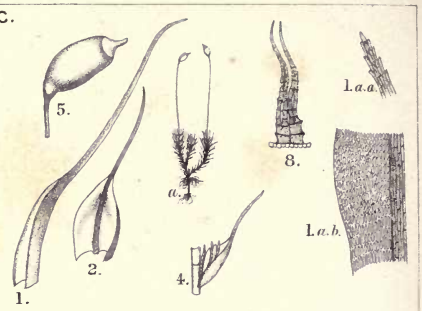
Swartzia montana.

C.



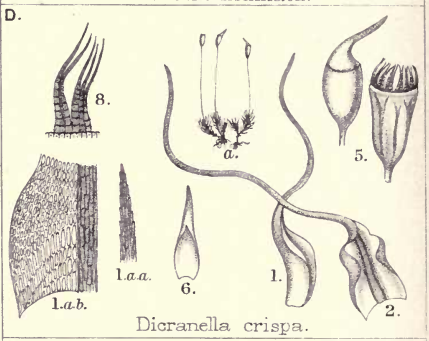
Dicranella heteromalla.

C.



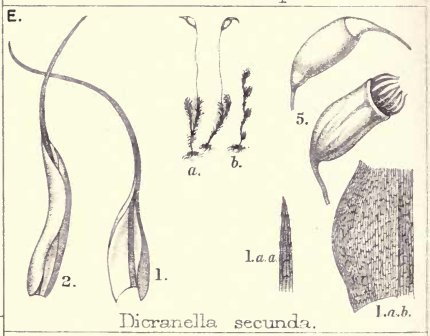
Swartzia inclinata.

D.



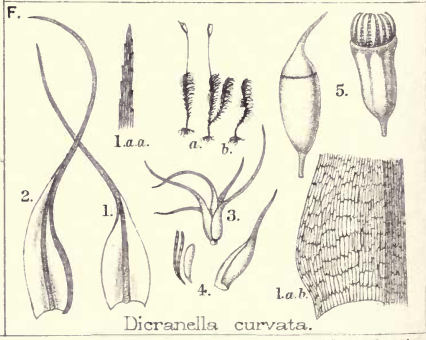
Dicranella crispa.

E.



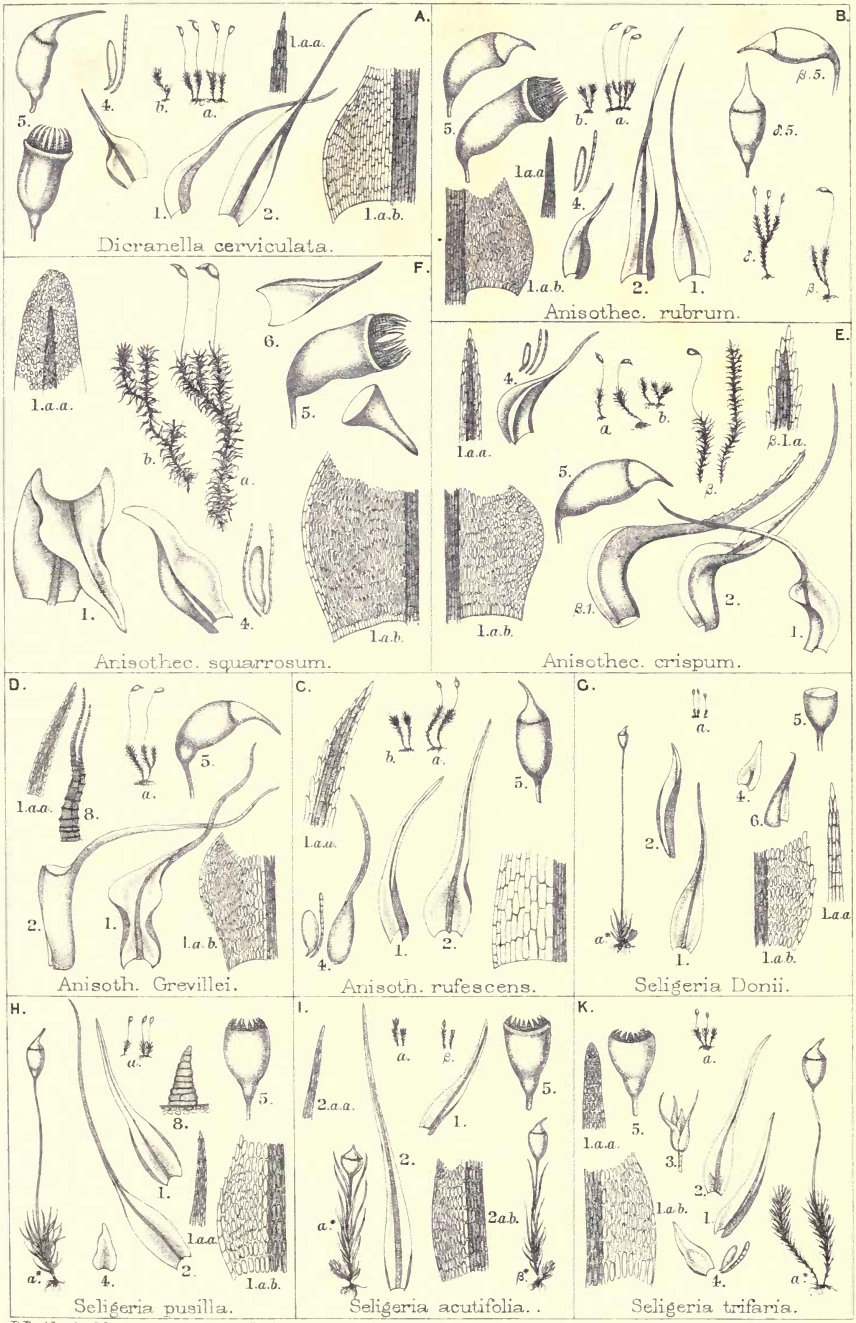
Dicranella secunda.

F.

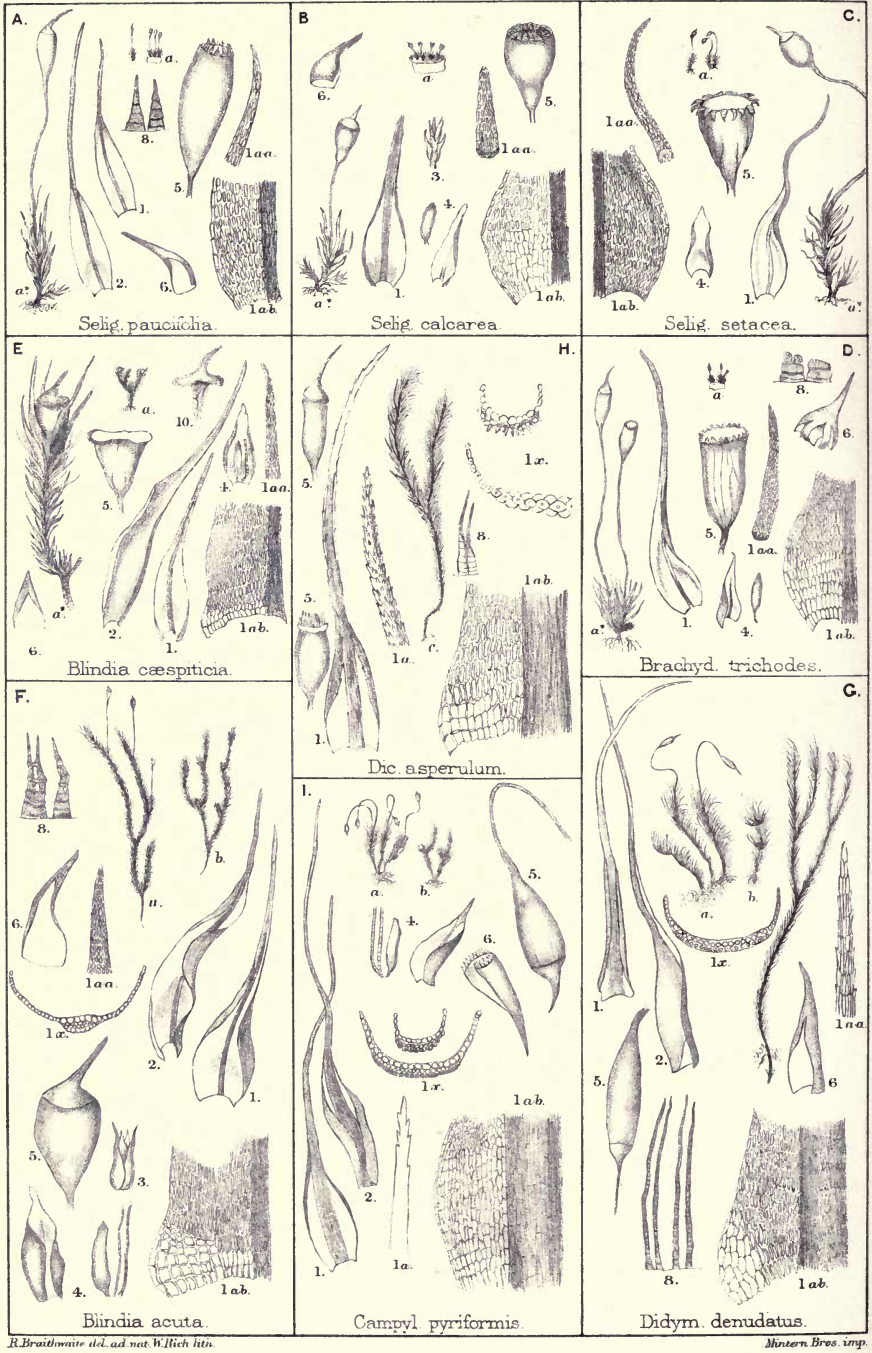


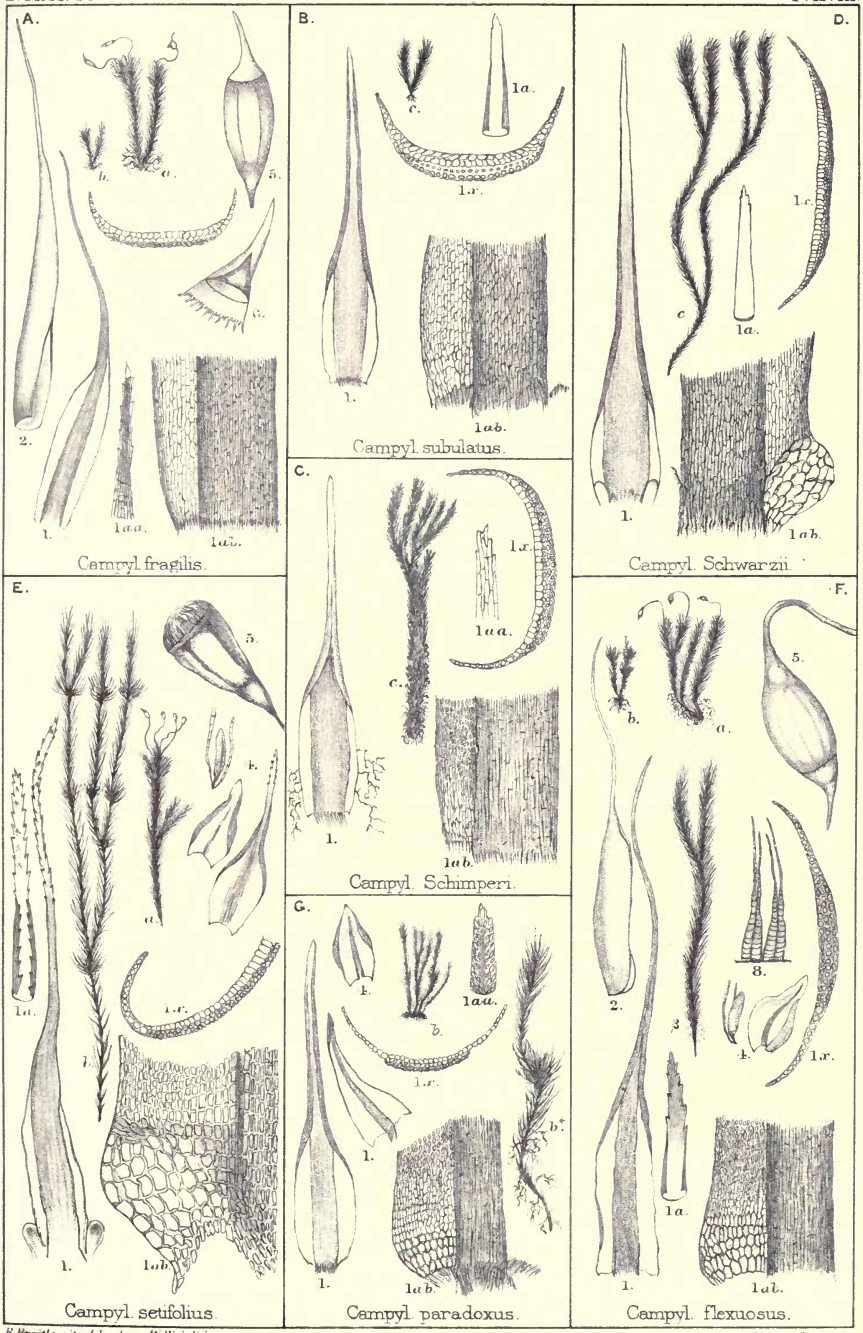
Dicranella curvata.

R. Braithwaite ad. nat. J. Nugent Fitch lith. Mintern Bro's imp.



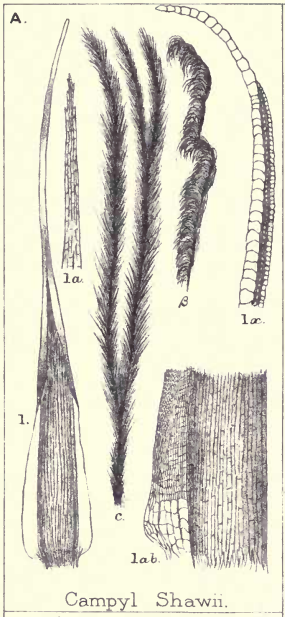
R. Braithwaite del. ad nat. J. Nugent Fitch lith. Mintern Bros imp.


A.
Selig. paucifolia.
B
Selig. calcarea.
C.
Selig. setacea.
E
Blindia cæspiticia.
H.
Dic. asperulum.
D.
Brachyd. trichodes.
F.
Blindia acuta.
I.
Campyl pyriformis.
G.
Didym. denudatus.

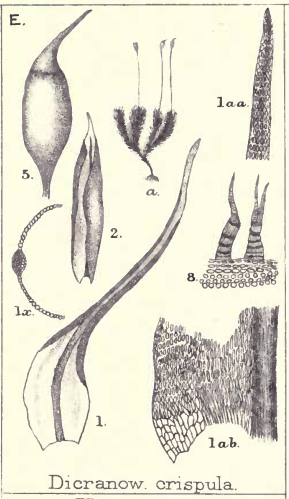


R. Braithwaite del. ad. nat. W. Rich lith.

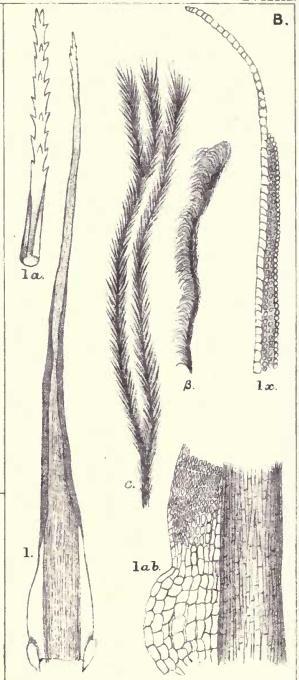
Mintern Bros. imp.



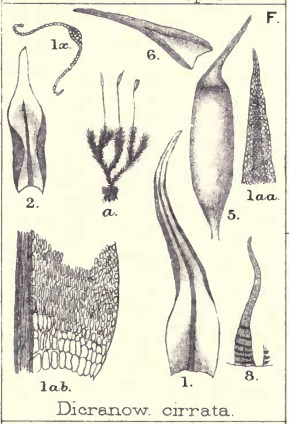
Campyl Shawii.



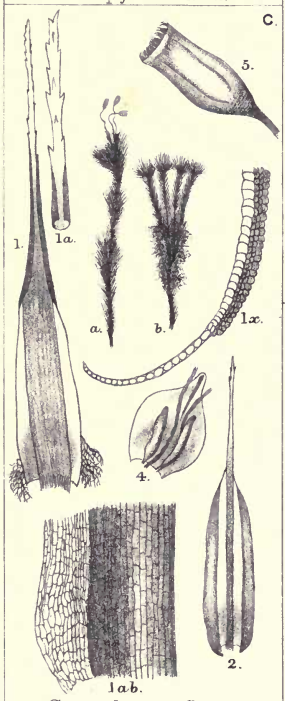
Dicranow. crispula.



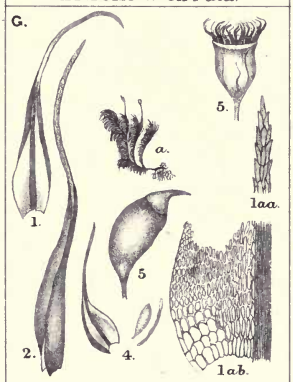
Campyl. atrovirens.



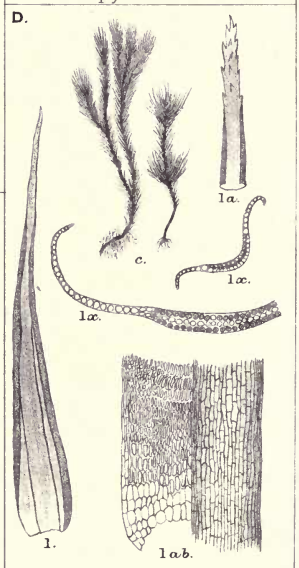
Dicranow. cirrata.



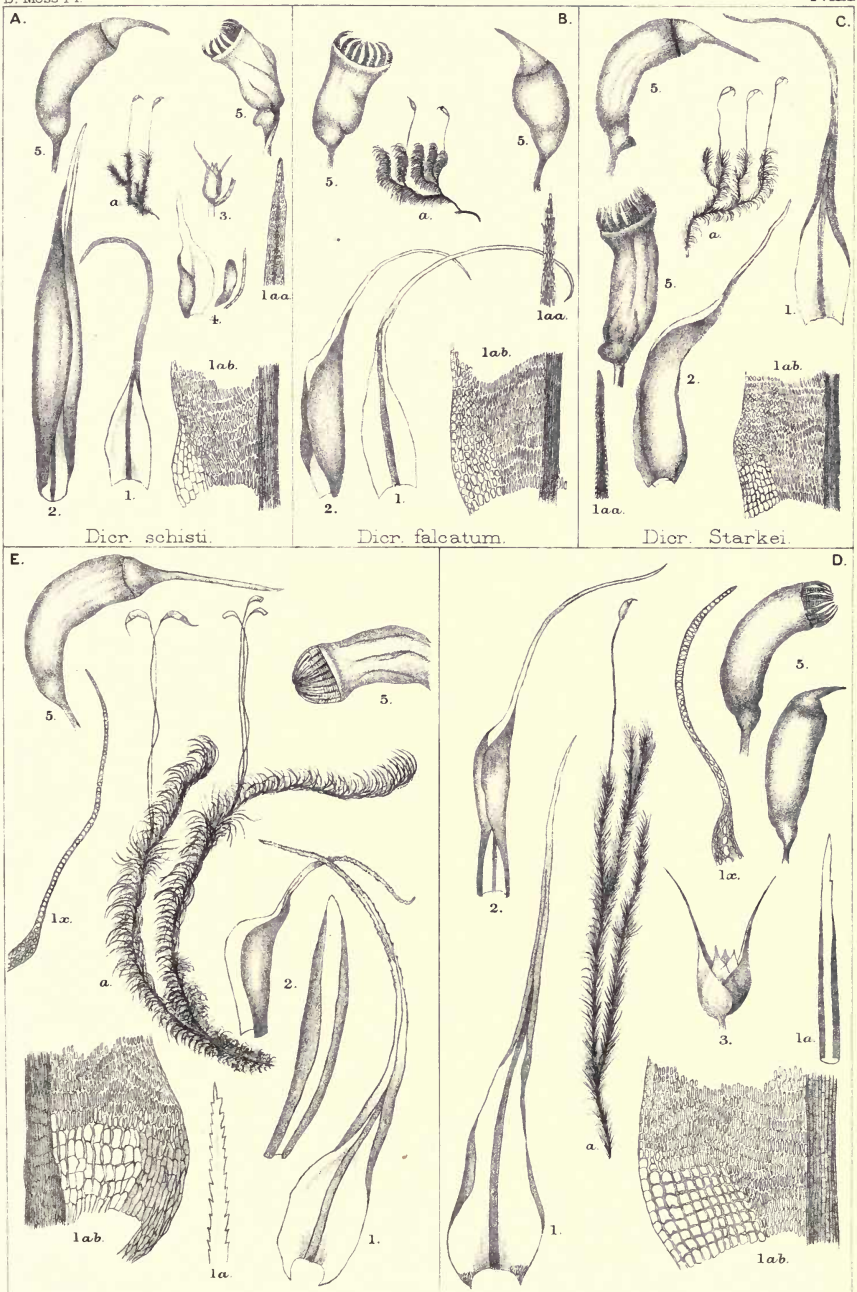
Campyl. introflexus.



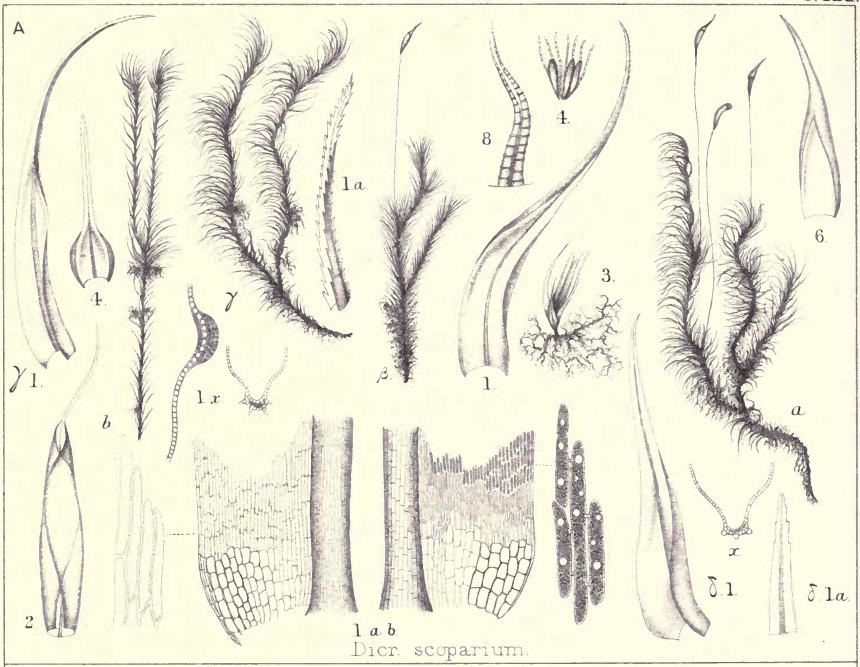
Dicran. fulvellum.



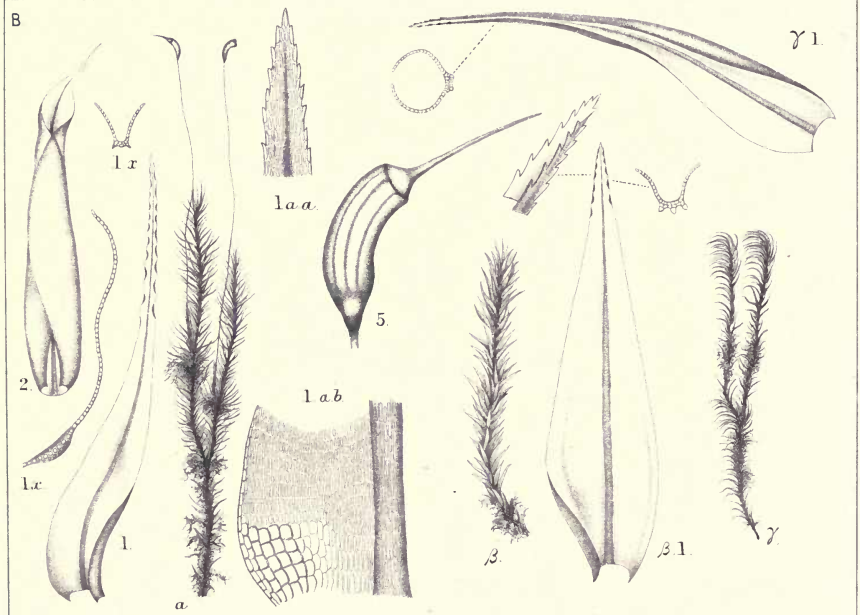
Campyl. brevipilus.



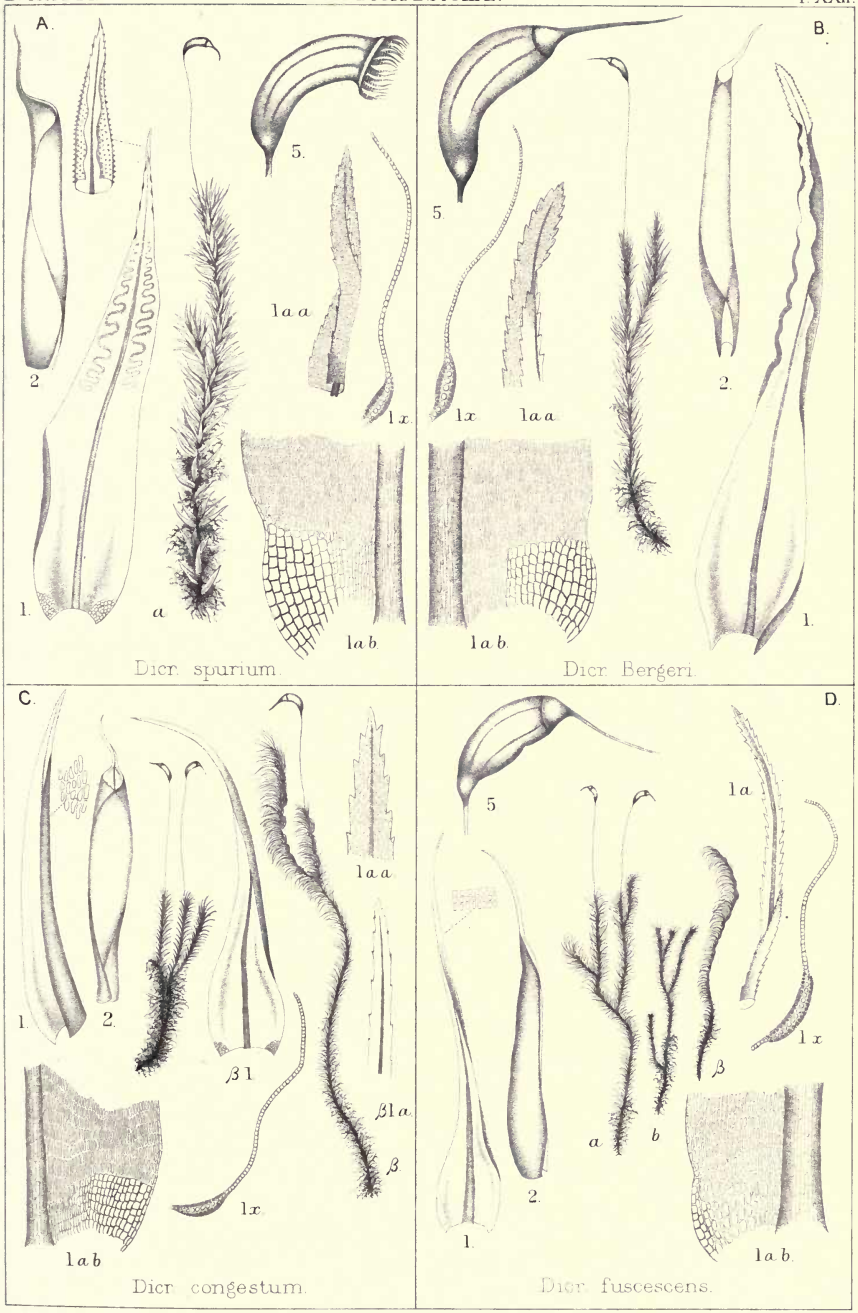
R. Braithwaite del. ad. nat. W. Rich. lith. Mintern. Bros. imp.

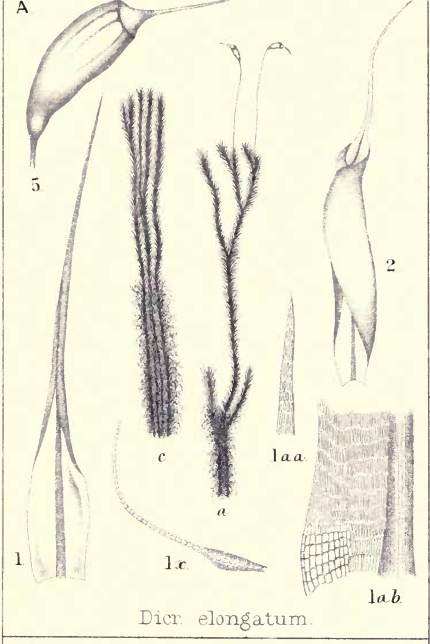


Dicr. scoparium.

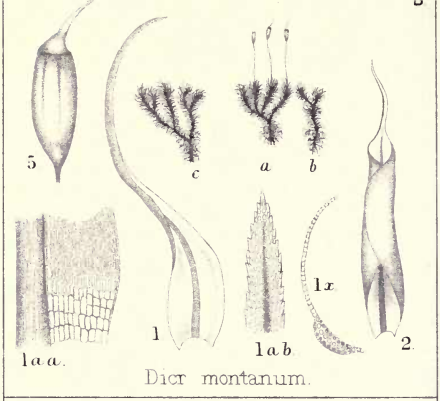


Dicr Bonjeani.

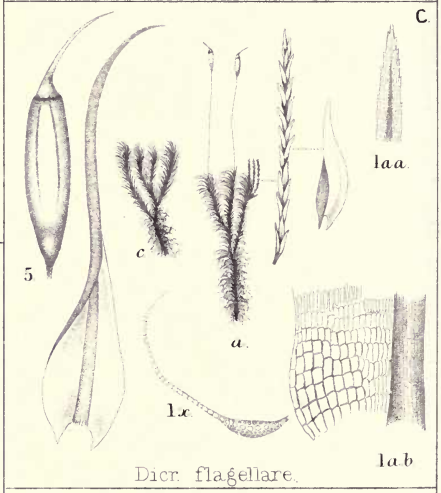

A.
2
1.
a
5.
1 a a
1 x
1 a b
Dicr. spurium.
B.
5.
1 x
1 a a
2.
1.
1 a b
Dicr. Bergeri.
C.
1.
2.
1 a a
β 1
β 1 a
β
1 x
1 a b
Dicr. congestum.
D.
5
1 a
1 x
β
a
b
2.
1.
1 a b
Dicr. fuscescens.



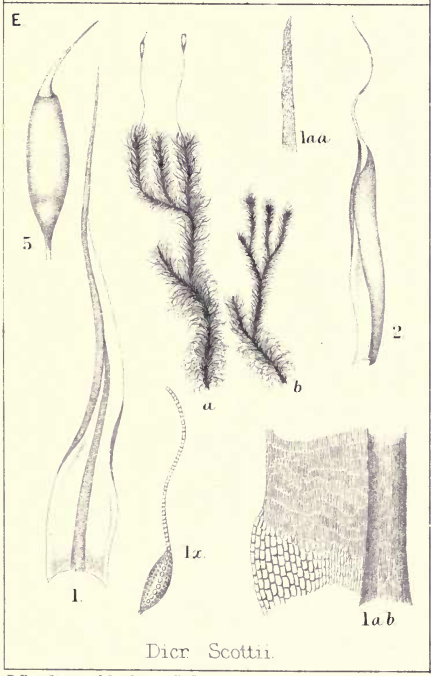
Dicr. elongatum.



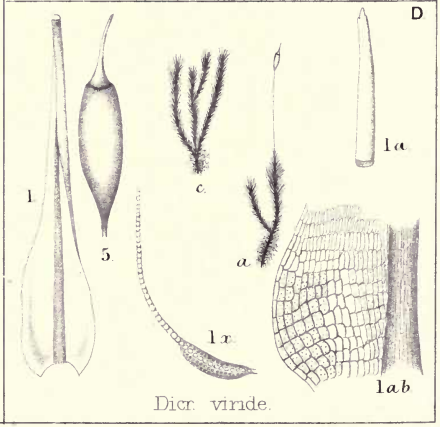
Dicr. montanum.



Dicr. flagellare.



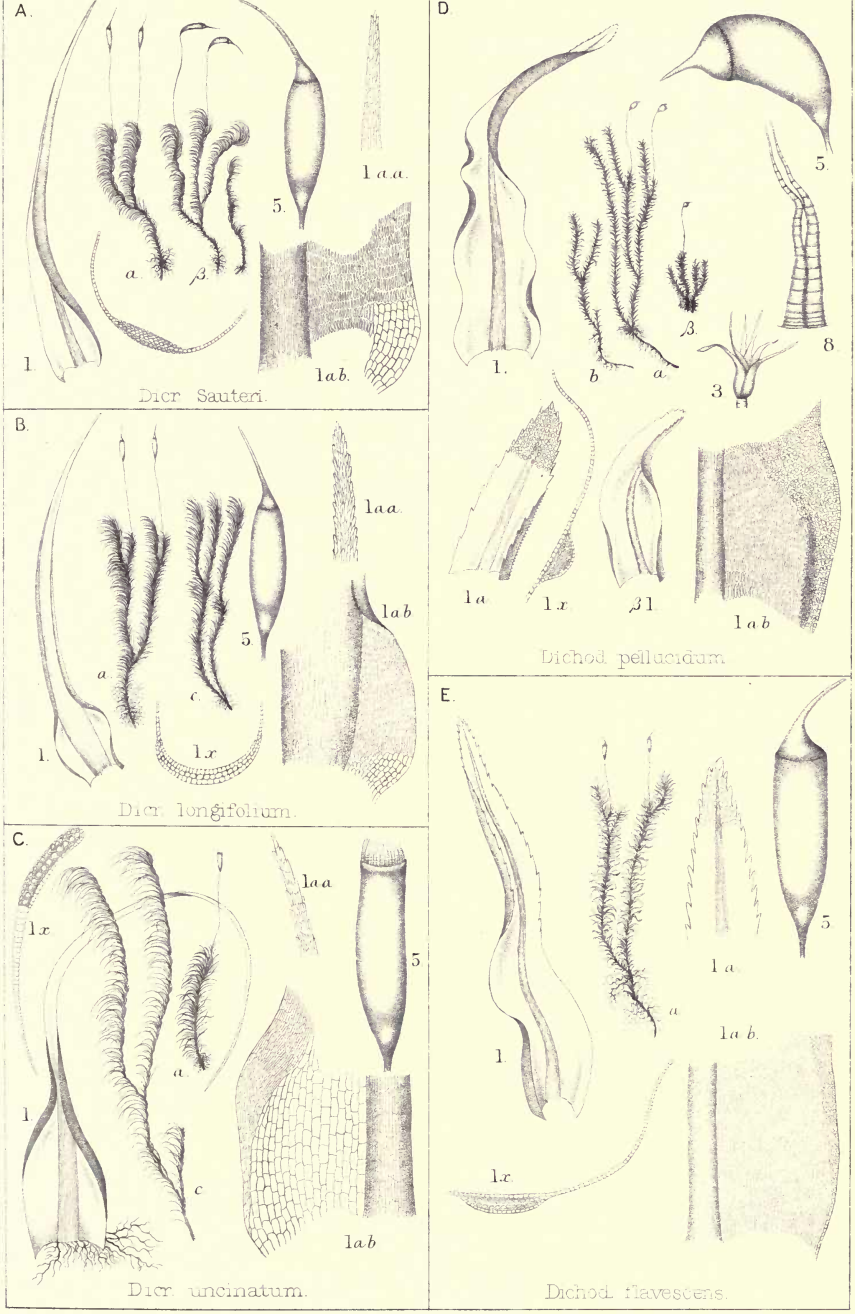
Dicr. Scottii.



Dicr. viride.

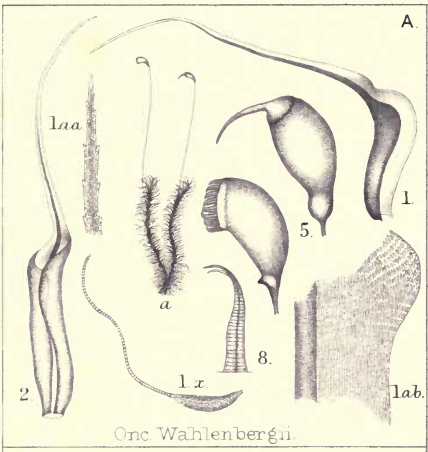
R.Braithwaite del. ad. nat. E. Carter sc.

Mintern Bros. imp.

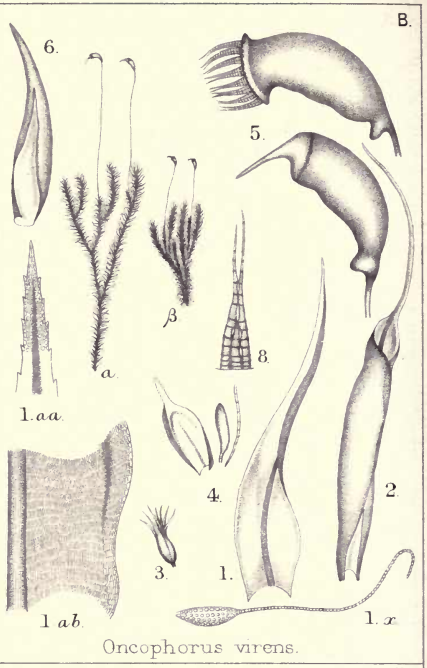


R.Braithwaite del. ad. nat. E.Carter sc.

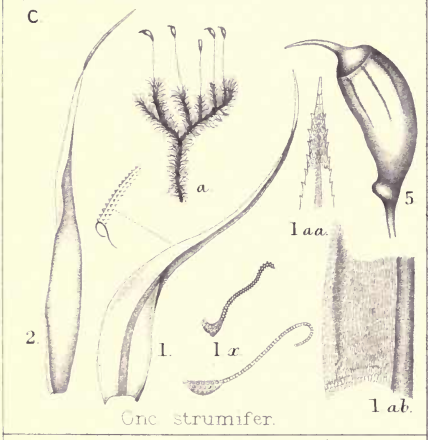
Mintern Bros. imp.



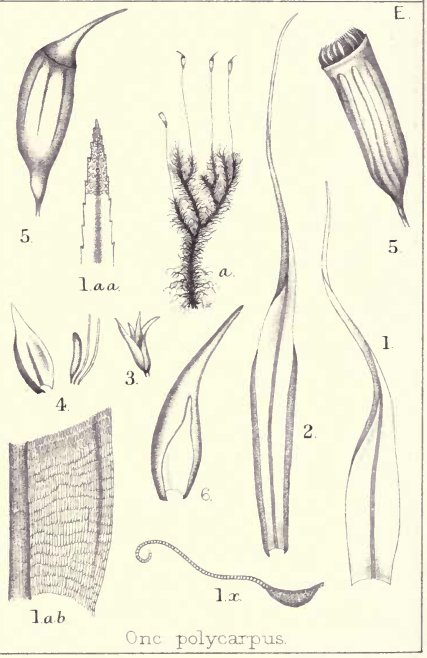
Onc. Wahlenbergii.



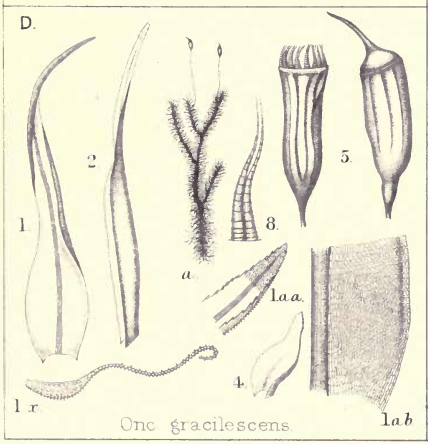
Oncophorus virens.



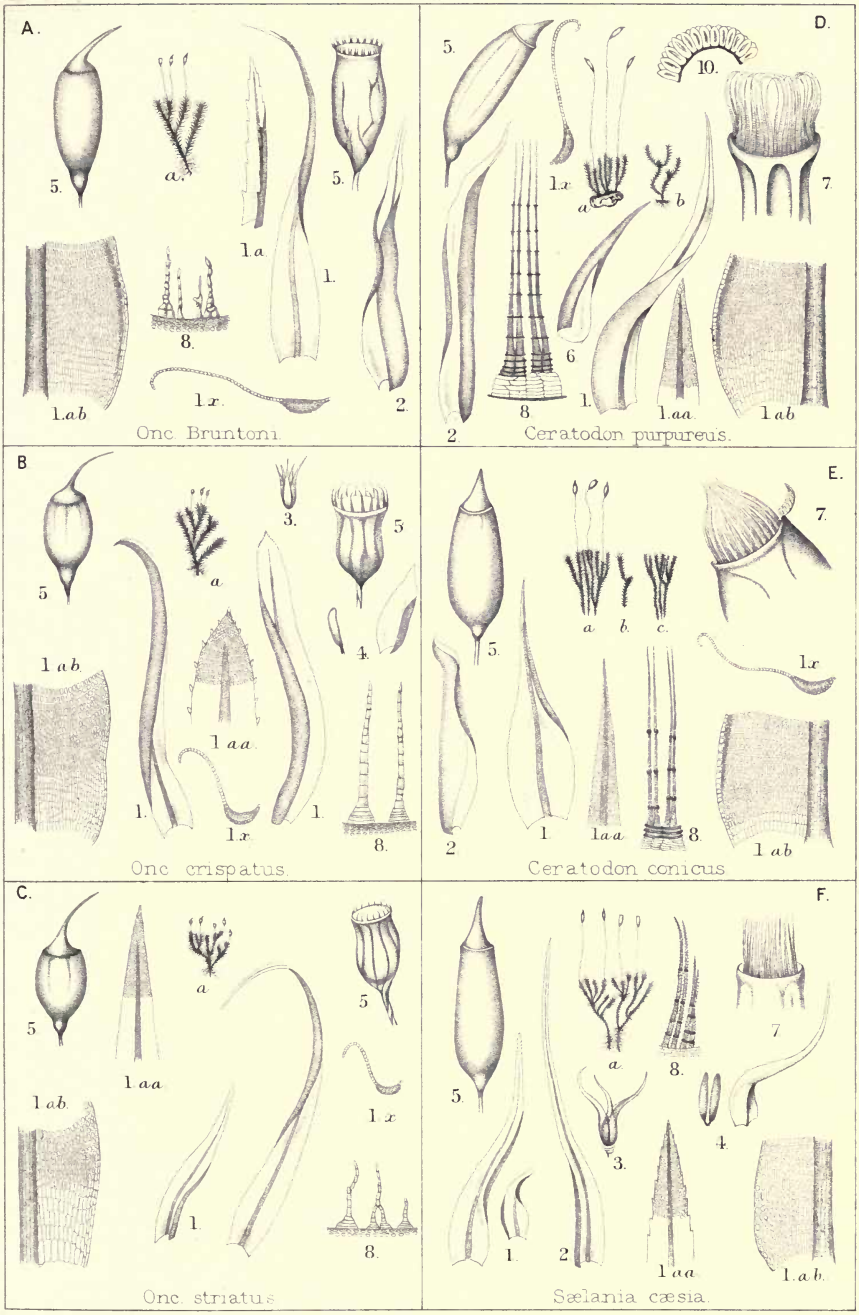
Onc. strumifer.



Onc. polycarpus.



Onc. gracilescens.


A.
5.
a.
1.a
5.
1.
8.
1.ab
1.x.
2.
Onc. Bruntoni.
D.
5.
10.
1.x
a
b
7.
6
1.
8.
1.aa
1.ab
2
Ceratodon purpureus.
B.
5
a.
3.
5
1.ab
4.
1.aa
1.
1.x
1.
8.
Onc. crispatus.
E.
7.
5.
a.
b.
c.
1.x
1.ab
2
1
1.aa
8.
Ceratodon conicus.
C.
5
a
5
1.aa
1.ab
1.x
1.
8.
Onc. striatus.
F.
5.
a
8.
7
3.
4
1.
2
1.aa
1.a.b.
Sælania cæsia.

TORTULACEÆ.

Subf. 1 *TORTULEÆ.*

EPHEMERUM Hampe.

1. **Ephem. serratum** (*Schreb.*) *Hampe.*
2. ——— **minutissimum** *Lindb.*
3. ——— **intermedium** *Mitt.*
4. ——— **cohærens** (*Hedw.*) *Hampe.*
5. ——— **stenophyllum** *Voit*) *Schpr.*
6. ——— **recurvifolium** (*Dicks.*) *Hampe.*

ACAULON C. Muell.

1. **Acaulon muticum** (*Schreb.*) *C. M.*
2. ——— **mediterraneum** *Limpr.*
3. ——— **triquetrum** (*Spruce*) *C. M.*

PHASCUM L.

1. **Phascum acaulon** *L.*
2. ——— **Floerkei** *Web. Mohr.*
3. ——— **curvicolle** *Ehrh.*

POTTIA Ehrh.

1. **Pottia recta** (*With.*) *Mitt.*
2. ——— **bryoides** (*Dicks.*) *Mitt.*
3. ——— **Heimii** (*Hedw.*) *Fuern.*
4. ——— **truncatula** (*L.*) *Lindb.*
5. ——— **intermedia** (*Turn.*) *Fuern.*
6. ——— **litoralis** *Mitt.*
7. ——— **lanceolata** (*Hedw.*) *C. M.*
8. ——— **cæspitosa** (*Bruch*) *C. M.*
9. ——— **Starkei** (*Hedw.*) *C. M.*
10. ——— **asperula** *Mitt.*
11. ——— **viridifolia** *Mitt.*
12. ——— **Wilsoni** (*Hook.*) *Br. Sch.*
13. ——— **crinita** *Wils.*
14. ——— **latifolia** (*Schwaeg.*) *C. M.*

TORTULA Hedw.

1. **Tortula pusilla** (*Hedw.*) *Mitt.*
2. ——— **lamellata** *Lindb.*
3. ——— **brevirostris** *Hook. Grev.*
4. ——— **stellata** (*Schreb.*) *Lindb.*
5. ——— **ericæfolia** (*Neck.*) *Lindb.*
6. ——— **aloides** (*Koch*) *De Not.*
7. ——— **atrovirens** (*Sm.*) *Lindb.*
8. ——— **cuneifolia** (*Dicks.*) *Roth.*
9. ——— **Vahlii** (*Schultz*) *Wils.*
10. ——— **marginata** (*Br. Sch.*) *Spruce.*
11. ——— **canescens** *Mont.*
12. ——— **muralis** (*L.*) *Hedw.*
13. ——— **subulata** (*L.*) *Hedw.*
14. ——— **angustata** *Wils.*
15. ——— **suberecta** *Drumm.*
16. ——— **mutica** (*Schultz*) *Lindb.*
17. ——— **papillosa** *Wils.*
18 ——— **lævipila** (*Brid.*) *Schwaeg.*
19. ——— **montana** (*Nees*) *Lindb.*
20. ——— **ruralis** (*L.*) *Ehrh.*
21. ——— **princeps** *De Not.*

PLEUROCHÆTE Lindb.

1. **Pleur. squarrosa** (*Brid.*) *Lindb.*

MOLLIA Schrank.

1. **Mollia crispa** (*Hedw.*) *Lindb.*
2. ——— **multicapsularis** (*Sm.*) *Lindb.*
3. ——— **Mittenii** (*Br. Sch.*) *Braithw.*
4. ——— **rostellata** (*Brid.*) *Lindb.*
5. ——— **microstoma** (*Hedw.*) *Lindb.*
6. ——— **squarrosa** (*Nees Hsch.*) *Lindb.*
7. ——— **condensa** (*Voit*) *Lindb.*
8. ——— **viridula** (*L.*) *Lindb.*
9. ——— **rutilans** (*Hedw.*) *Lindb.*
10. ——— **tenuis** (*Schrad.*) *Lindb.*
11. ——— **calcarea** (*Nees Hsch.*) *Lindb.*
12. ——— **æruginosa** (*Sm.*) *Lindb.*
13. ——— **verticillata** (*L.*) *Lindb.*
14. ——— **crispula** (*Bruch*) *Lindb.*
15. ——— **litoralis** (*Mitt.*) *Lindb.*
16. ——— **brachydontia** (*Bruch*) *Lindb.*
17. ——— **lutescens** *Lindb.*
18. ——— **tenuirostris** (*Hook. Tay.*) *Lindb.*
19. ——— **hibernica** (*Mitt.*) *Lindb.*
20. ——— **flavovirens** (*Bruch*) *Lindb.*
21. ——— **nitida** *Lindb.*
22. ——— **inclinata** (*Hedw. fil.*) *Lindb.*
23. ——— **tortuosa** (*L.*) *Schrank.*
24. ——— **fragilis** (*Drumm.*) *Lindb.*

LEPTODONTIUM Hampe.

1. **Leptod. flexifolium** (*Dicks.*) *Hampe.*
2. ——— **gemmascens** (*Mitt.*) *Braithw.*
3. ——— **recurvifolium** (*Tayl.*) *Lindb.*

BARBULA Hedw.

1. **Barbula curvirostris** (*Ehrh.*) *Lindb.*
2. ——— **rubella** (*Hoffm.*) *Mitt.*
3. ——— **lurida** (*Hornsch.*) *Lindb.*
4. ——— **brevifolia** (*Dicks.*) *Lindb.*
5. ——— **fallax** *Hedw.*
6. ——— **reflexa** *Brid.*
7. ——— **spadicea** *Mitt.*
8. ——— **rigidula** (*Hedw.*) *Mitt.*
9. ——— **acuta** *Brid.*
10. ——— **cylindrica** (*Tayl.*) *Schimp*
11. ——— **sinuosa** (*Wils.*)
12. ——— **Hornschuchii** *Schultz.*
13. ——— **revoluta** (*Schrad.*) *Brid.*
14. ——— **convoluta** *Hedw.*
15. ——— **unguiculata** (*Huds.*) *Hedw.*
16. ——— **mucronata** *Brid.*

Subf. 2. *CINCLIDOTEÆ.*

CINCLIDOTUS P. Beauv.

1. **Cincl. fontinaloides** (*Hedw.*) *P. Beauv.*

Subf. 3. *LEERSIEÆ.*

LEERSIA Hedw.

1. **Leersia alpina** (*Sm.*) *Lindb.*
2. ——— **exstinctoria** (*L.*) *Leyss.*
3. ——— **laciniata** *Hedw.*
4. ——— **rhabdocarpa** (*Schwaeg.*) *Lindb.*
5. ——— **contorta** (*Wulf.*) *Lindb.*

Fam. 8. TORTULACEÆ.

Plants generally rooting only at base, cæspitant or pulvinate, dichotomous and fastigiate branched. Leaves ovate, lanceolate or spathulate, soft, areolation above hexagono-quadrate and rounded, usually highly chlorophyllose and papillose, at base larger, hexagono-rectangular, hyaline. Calyptra cucullate, rarely mitræform or lobed; caps. erect, oval, oblong or subcylindric, cleistocarpous, gymnostomous or peristomate, teeth 16, on a more or less elongated tubular basal membrane, lanceolate, or irregularly perforated, or cleft to base into 32 lineal or filiform legs; strongly papillose, straight, oblique or contorted; spores large and granulose or small and smooth. Inhabiting the ground, walls, rocks and tree-trunks; much more prevalent in the lowlands than on mountains.

This widely distributed family, so rich in species—for it includes probably not less than 800—is a most difficult one to deal with, and has taxed the ingenuity of every bryologist to arrange the species in well-defined genera. The variations in habit, colour and leaf-structure afford more stable ground for generic characters than the peristome, and this was first advocated by Mr. Mitten in his *Musci Indiæ Or.* (1859), but there has been an indisposition to break up the great genus *Tortula*, resting solely on the twisted peristome, but combined with a variable structure of leaves, and still stronger was the objection to admit gymnostomous species as congeners with peristomate ones, although no mosses more clearly exhibit the weakness of this distinction than some of the old *Gymnostomums* now referred to *Pottia*, and the genus *Anacalypta*. Lindberg in his *Musci Scandinaviæ* has fully carried out the modern views, and I can only advise all bryologists to study the plants themselves under this newer aspect, feeling assured that they will soon appreciate the soundness of a natural classification.

Mitten and Lindberg unite *Pottia* with *Tortula*, and no doubt correctly, if we take a wide view of the genus, but as the *Pottias* have a certain distinctive habit, and when the peristome is present the teeth have usually a flat form, I have retained the genus, rather perhaps from the point of convenience, as every one must see that *Pottia pusilla* and *Tortula lamellata* ought to be congeneric.

We shall perhaps get the truest conception of the genera if we regard each as the centre of a group of species, among which are phascoid, gymnostomous and peristomate forms, and radiating in various directions towards each other; *e.g.*, *Tortula ruralis* and *Encalypta streptocarpa* have a strong point of affinity in the verruciform papillæ of their leaves. The form of the papillæ deserves notice, and they have not perhaps had sufficient attention directed

to them, thus in *Pottia* they are conical and also in many species of *Barbula* and *Tortula;* in others again they are cleft in the centre by a semilunar excavation, and in some as just mentioned, still more lobulate like a wart.

The teeth of the peristome are also usually rough with minute papillæ, and they exhibit such gradual stages of development in the membrane which unites them at base, from a scarcely projecting band to a long tesselated tube, that the variations fail to afford a generic character, though available for minor groups.

Of still less value is the direction of the teeth, for they may be quite straight, or ascend obliquely, or form a half spiral or one of several turns. Three European genera do not enter into our Flora, *Aschisma* LINDB. founded on *Phascum carniolicum*, *Molendoa* LINDB. for *Anœctangium Hornschuchii* and its variety *Sendtneri*, and *Scopelophila* MITTEN=*Merceya* SCHIMP. allied to *Encalypta*. Special papers on this family are SCHULTZ "*Recensio generum Barbulæ et Syntrichiæ*" in Nova Acta Phys.-Med. acad. cæs. Leop. Carolin. nat. cur. xi, I, 191 (1823), DE NOTARIS "*Musci Italici.*" fasc. 1, *Tortula* (1862); and LINDBERG "*De Tortulis et ceteris Trichostomaceis Europæis*" in Oefv. af kön. vetens. akad. Foerhandl. xxi (1864). Schultz remarks on the difficulty of separating some *Tortulæ* from *Trichostomum*.

Subf. 1. *TORTULEÆ*. Calyptra cucullate. Teeth of peristome papillose, straight or contorted, 16, cleft to base or more or less united into a tube; sometimes wanting, or the capsule may be inoperculate.

1. EPHEMERUM HAMPE.

(Flora, 1837, p. 285.)

Plants simple, minute, gregarious, with persistent, dichotomous, fasciculate-branched protonema forming a byssaceous tuft. Leaves sparingly chlorophyllose, the cells rhomboidal, lax, hyaline; smooth or papillose. Calyptra thin, campanulate, cleft on one side or lacerate at base. Capsule immersed in the perichætium, globose, apiculate, cleistocarpous, composed of two strata of cells, without special spore sac or columella; spores large. Male plants very small, nestling near the female on the same protonema, bracts 3—4, with few or no paraphyses. Inhabiting moist bare places.—Der. εφημερος, evanescent.

Among the most minute of mosses, and only evident by the numerous individuals aggregated into patches; their structure also is frail and delicate, and they seem incapable of maintaining independent existence, but like poor weakly children, retain their nurse on the establishment all through their short lives, in their supporting protonema; yet when brought under the microscope they prove to be veritable little gems, and well repay careful investigation. About 18 species are known, chiefly from N. America and the Cape of Good Hope, and although they have been usually placed with the Funariaceæ, their affinity appears to be greater with the genus *Phascum*, both in the calyptra and areolation.

CLAVIS TO THE SPECIES.

Leaves nerveless.	
Leaves ovato-lanceolate, spores rough.	*serratum.*
Leaves lanceolate-acuminate, spores smooth.	*minutissimum.*
Leaves nerved.	
Nerve lost in lower half of leaf.	*intermedium.*
Nerve distinct below.	
Nerve vanishing at apex.	*cohærens.*
Nerve excurrent.	
Leaves lanc.-subulate, nerve $\frac{1}{4}$ width of base.	*stenophyllum.*
Leaves oblong-linear, nerve $\frac{1}{3}$ width of base.	*recurvifolium.*

1. EPHEMERUM SERRATUM (*Schreb.*) *Hampe.*

Leaves ovato-lanceolate, nerveless, serrate. Capsule immersed, glossy purple, oval-globose with a blunt point, spores rough. (T. XXVII, A.)

SYN.—*Phascum serratum* SCHREB. de Phasco 9, t. 2 (1770), Spic. Fl. lips. 73 (1771). WEB. Spic. fl. goett. 124 (1778). WIGG. Prim. fl. hols. 81 (1780). DICKS. Pl. crypt. Fasc. I, 1, t. 1, fig. 1 (1785). ROTH Fl. germ. i, 452 (1788) et iii, P. I, 115. TIMM Pr. fl. meg. n. 720 (1788). Eng. Bot. t. 460. SCHRAD. Spic. fl. germ. i, 58 (1794). WITH. bot. arr. br. veg. 3 ed. iii, 785 (1796). BRID. Musc. rec. II, P. I, 11 (1798), Sp. musc. I, 2 (1806), Mant. 6 (1819), Bry. univ. i, 28 (1826). HULL Br. fl. P. 2, 251 (1799). ROEHL. Moosg. deutsch. 19 (1800), Deutsch. fl. iii, 33 (1813), Ann. wet. ges, i, 183. HEDW. Sp. musc. 23 (1801). SM. Fl. brit. iii, 1166 (1804). TURN. Musc. hib. 4 (1804). P. BEAUV. Prodr. 82 (1805). SCHULTZ Fl. starg. 271 (1806). WEB. MOHR. Bot. Tasch. 71 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 10, t. 4 (1810). SCHWAEG. Suppl. I, P. I, 6 (1811). VOIT Musc. herb. 9 (1812). LA PYL. Journ. Bot. 1813, p. 285, t. 20, f. 17. MART. Fl. cr. erl. 124 (1817). HOOK. TAYL. Musc. br. 4, t. 5 (1818). GRAY Nat. arr. br. pl. i, 710 (1821). FUNCK Moost. 2, t. 1 (1821). HOOK. Fl. scot. P. II, 121 (1821), Brit. fl. ii, 2 (1833). NEES HSCH. Bry. germ. i, 35, t. 4, f. 1 (1823). HUEBEN. Musc. germ. 2 (1833). HARTM. Skand. fl. MACK. Fl. hib. P. 2, 7 (1836). BR. SCHIMP. Bry. eur. fasc. 1, p. 6, t. 1 (1837). DE NOT. Syll. musc. 313 (1838). WILS. Bry. brit. 26, t. 5 (1855). HOBK. Syn. br. m. 26 (1873).

Phascum stoloniferum DICKS. Pl. crypt. fasc III, 1, t. 7, f. 2 (1793). WITH. op. c. 786. HULL op. c. 252. SM. Fl. Brit. 1157, Eng. Bot. t. 2006.

Phasc. velutinum HOFFM. Deutsch. fl. ii, 20 (1796).

Phasc. confervoides BRID. Musc. rec. II, P. I, 12. ROEHL. Deutsch. moos. 20. P. BEAUV. Prodr. 81.

Ephemerum serratum HAMPE in Flora 1837, p. 285. RABENH. Deutsch. kr. fl. ii, S. 3, 84 (1848). C. MUELL. in Bot. Zeit. 1847, p. 101; Syn. musc. i, 31 (1849). BR. SCHIMP. Bry. eur. fasc. 42, Mon. 3, t. 1 (1849). SCHIMP. Synops. 3 (1860). BERK. Handb. br. m. 304 (1863). DE NOT. Epil. briol. ital. 742 (1869). MILDE Bry. siles. 190 (1869). JAEGER Ber. der St. Gall. nat. gesells. 1869, p. 98. HUSN. Mouss. nord-ouest 32 (1873). JURATZ. Laubm. oester.-ung. 4 (1882). LESQ. JAMES Mosses N. Amer. 37 (1884).

Dioicous; plants very minute, nestling in dense intricate deep green protonema. Leaves nerveless, erecto-patent, 6—9, lower very small ovato-acuminate, upper much larger, ovato-lanceolate, the margin coarsely and irregularly serrate to below the middle; cells lax hyaline, rhombo-hexagonal, upper smaller, more or less incrassate. Caps. immersed, almost sessile, subglobose, shortly apiculate, glossy rufous purple; calyp. whitish, reaching middle of caps. bi-trilacerate; spores 50—100, ferruginous, granulated. Male pl. near the female, fuscescent; bracts 3, ovato-lanceolate toothed.

HAB.—Damp clay fields and ditch-banks; not rare. Fr. 12—2.

2. EPHEMERUM MINUTISSIMUM *Lindb.*

Leaves narrowly lanceolato-acuminate, nerveless, serrate. Capsule emergent, castaneous, spores smooth. (T. XXVII, B.)

SYN.—*Ephemerum serratum* Var. β. *angustifolium* Bry. eur. fasc. 42 (1849). SCHIMP. Synops. et alior. auct. p.p.

Ephemerum minutissimum LINDB. in Not. ur Sälls. pro Fn. Fl. fenn. förh. xiii, 411 (1874).

Ephemerum novale MITT. in litt.

Dioicous, resembling *E. serratum* but much smaller. Leaves shorter, erecto-patent or subsecund, narrowly lanceolate, channelled, attenuated and flexuose at points, margin irregularly serrate above, cells more elongated. Capsule emergent, leptodermous, pale castaneous, larger in proportion to the size of plant, globose ovate with a conical point; calyptra irregularly split into several lobes; spores smooth, smaller.

HAB.—Ploughed fields. Fr. 11.

Near Hurstpierpoint (*Mitten*, 1845)!!

Mr. Mitten's name had been engraved on the plate before its identity with Lindberg's species had been determined. There is something in the look of the plant, so different from that of *E. serratum*, that we think there can be no doubt of its distinctness, while its small size has caused it to be overlooked.

3. EPHEMERUM INTERMEDIUM *Mitt.*

Plants on much branched protonema. Leaves broadly lanceolate, faintly nerved in the upper half only. Spores slightly rough. (T. XXVII, C.)

SYN.—*Ephemerum cohærens* p.p. SCHIMP. WILS. Bry. brit. 27. BERK. Handb. br. m. 304. HOBK.

Ephemerum intermedium MITT. in litt.

Ephem. tenuinerve LINDB. MSS.

Ephem. serratum Var. γ. *præcox* JAEG. Ber. St. Gall. gesells. 1869, p. 99.

Dioicous; resembling *E. serratum*, the plants very small, on much branched protonema. Leaves broadly lanceolate, coarsely serrate in the upper half, the lower small, nerveless, upper elongated, narrowed into a longish point composed entirely of the faint nerve, which is wanting in the lower half of the leaf; cells at base lax, more chlorophyllose, upper firmer, narrower more incrassate. Caps. reddish brown, globose, apiculate; cal. deeply cleft on one side, with 2—3 lacerations at base; spores large, granulose.

HAB.— Fallow fields, rare. Fr. 10—12.

Hurstpierpoint (*Mitten* 1847)!! Exposed mud of pond at Pondleigh (*Mitten*). Near Brighton and several places in the Weald of Sussex (*Davies* 1858)!!

This moss is nearer to *E. serratum* than to the next species, and as the two sometimes grow together, it is probable that Schimper was thus led astray, and his remarks at p. 4 of the Synopsis 2 ed. explained; Wilson evidently did not distinguish it.

4. EPHEMERUM COHÆRENS (*Hedw.*) *Hampe.*

Dioicous; leaves oblongo-lanceolate, serrulate, nerved to apex. Caps. globose, brown-purple. (T. XXVII, D.)

SYN.—*Phascum cohœrens* HEDW. Sp. musc. 25, t. 1, f. 1—6 (1801). BRID. Sp. musc. I, 4 (1806), Mant. 6 (1819), Bry. univ. i, 29 (1826). SCHWAEG. Suppl. I, P. I, p. 4 (1811). LA PYL. Journ. bot. 1813, p. 280, t. 19, f. 10. BR. SCHIMP. Bry. eur. fasc. 1, p. 6, t. 1 (1837).

Phasc. heterophyllum DE NOT. Musc. ital. spic. 23 (1837); Syllab. 313 (1838).

Ephemerum cohœrens HAMPE Flora 1837, p. 285. RABENH. Deutsch kr. fl. ii, s. 3, 84 (1848). C. MUELL. Bot. zeit., 1847, p. 101. Synops. 1, 32 (1849). BR. SCHIMP. Bry. eur. fasc. 42, t. 1 (1849). SCHIMP. Synops. 5 (1860), 2 ed. 4 (1876). DE NOT. Epil. bri. ital. 742 (1869). MILDE Bry. siles. 189 (1869). JAEG. Ber. St. Gall. gesells. 1869, p. 100. JURATZ. Laubm. oester.-ung. 5 (1882). LESQ. JAMES Mosses N. Amer. 39 (1884).

Dioicous; resembling *E. serratum*, protonema paler, less dense, becoming reddish-brown by age. Lower leaves lanceolate, upper erect, oblongo-lanc. denticulate toward apex with projecting cells; nerve soft, vanishing at or below apex, cells at base hexagono-rectangular, above hexagono-rhomboid. Caps. subglobose with a short point, brown, less solid; spores rough, brown.

HAB.—Moist banks; very rare. Fr. 11—2.

By the side of the River Shannon, near Portumna, Galway (*Moore*, 1865)!!

The Irish plant quite accords with the American in its erecto-patent leaves with slightly recurved points, and short upper cells, but the specimens are poor and stunted, and only half the size of the foreign ones.

5. EPHEMERUM STENOPHYLLUM (*Voit*) *Schimp.*

Autoicous; leaves lanc.-subulate, nerve thick, excurrent. Caps. small, subspherical with a short point. (T. XXVII, E.)

SYN.—*Phascum stenophyllum* VOIT in STURM Deutsch. fl. II, fasc. 14 (1813). FUNCK Moost. 2, t. 1 (1821). NEES HORNSCH. Bry. germ. i, 39, t. 4, f. 2 (1823). BRID. Bry. univ. i, 30 (1826). DE NOT. Syll. musc. 312 (1838). WILS. in Eng. Bot. t. 2829. HUEBEN. Musc. germ. 3 (1833).

Phascum sessile BR. SCHIMP. Bry. eur. fasc. 1. (1837). SCHIMP. in Pollichia ii, 49 (1844), et in Flora 1845. WILS. Bry. brit. 27, t. 37 (1855). HOBK. Syn. br. m. 27 (1873).

Phascum crassinervium (haud SCHWAEG.) BR. SCH. Bry. eur. fasc. 1, p. 7, t. 2 (1837).

Ephemerum crassinervium HAMPE in Flora 1837, p. 285. C. MUELL. in Bot. Zeit. 1847, p. 101.

Ephem. sessile RABENH. Deutsch. kr. fl. ii, S. 3, 85 (1848). C. MUELL. Synops. i, 33 (1849). BR. SCH. Bry. eur. fasc. 42, p. 5, t. 2 (1849). BERK. Handb. br. m. 304 (1863).

Ephem. stenophyllum SCHIMP. Synops. 5 (1860), 2 ed. 6 (1876). DE NOT. Epil. bri. ital. 743 (1869). MILDE Bry. siles. 189 (1869). JAEG. Ber. St. Gall. gesells. 1869, p. 101. JURATZ. Laubm. oester.-ung. 5 (1882). LESQ. JAMES Mosses n. Amer. 39 (1884).

Autoicous; rather taller than *E. serratum*, with green protonema. Lower leaves minute, lanc. nerveless, upper much longer, erect, rather rigid, lanceolate-subulate; margin more or less serrulate at apex, nerve pale and indistinct at base, thence stout, deep green and excurrent; cells at base elongated rectangular, above shorter, narrower and more incrassate. Caps. subspherical or ovate with a short point, rufescent;

calyp. torn at base into shreds; spores large, rough, ferruginous. Male infl. gemmiform basal.

HAB.—Clay or chalky soil on heaths; rare. Fr. 10—2.

Henfield common and Pondleigh (*Mitten* 1846)! ! Mere, Cheshire (*Wilson* 1854)! !

Var *β.* **brevifolium** *Schimp.* Syn. 2 ed. p. 6.

Leaves shorter, nearly entire, nerve reaching apex or vanishing.

SYN.—*Eph. sessile* Var. *stenophyllum* Bry. eur. l. c.
Phasc. sessile Var. *stenophyllum* WILS. Bry. brit.

HAB.—Mere, Cheshire (*Wilson*)! !

Great confusion exists in the works of early authors between this moss and the following, so that it is scarcely possible to disentangle the synonymy; a reference to the figures will show that in *E. recurvifolium*, the leaves are much longer and linear in outline, while in *E. stenophyllum*, they taper gradually upward to a point.

6. EPHEMERUM RECURVIFOLIUM (*Dicks.*) *Lindb.*

Dioicous; leaves lineal lanc. flexuose, recurved, denticulate at apex, nerve excurrent; capsule oval. (T. XXVII, F.)

SYN.—*Phascum recurvifolium* DICKS. Crypt. fasc IV, p. 1, t. 10, f. 2 (1801). TURN. Musc. hib. 2 (1804). BRID. Sp. musc. I, 4 (1806), Bry. univ. i, 31, p.p. (1826). SCHKUHR Deutsch. kr. Gew. ii, P. II, 11, t. 4? NEES HORNSCH. Bry. germ. i, 42, t. 5, f. 4? (1823). HUEBEN. Musc. germ. 9 (1833). WILS. Bry. brit. 28, t. 37 (1855). HOBK. Syn. br. m. 27 (1873). HUSN. Mouss. nord-ouest 33 (1873).

Phascum patens Var. SM. Fl. brit. iii, 1150 (1804)? HOOK. TAY. musc. brit. 7 (1818)? BRID. Bry. un. i, 34.

Phasc. pachycarpum SCHWÆG. Suppl. I, P. I, 6, t. 2 (1811). BR. SCH. Bry. eur. fasc. 1, Mon. 8, t. 2 (1837).

Phascum Dicksoni BRID. Mant. 7 (1819).

Phascum crassinervium NEES HORNSCH. Bry. germ. i, 40 p.p. t. 4, f. 3 (1823). BRID. Bry. univ. i, 32 p.p. GREV. Scott. cr. fl. vi, t. 353 (1829). HOOK. Brit. fl. ii, 3 (1833). WILS. in Eng. Bot. t. 2932.

Ephemerum pachycarpum HAMPE in Flora xx., P. I, 295 (1837)? RABENH. Deutsch. kr. fl. ii, P. 3, 85 (1848). SCHIMP. Bry. eur. fasc. 42, mon. 6, t. 2 (1849), Coroll. 3 (1855).

Physedium pachycarpum C. MUELL. in Bot. Zeit. 1847, p. 101.

Ephemerella pachycarpa C. MUELL. Synops. i, 34 (1849).

Ephemerella recurvifolia SCHIMP. Synops. 7 (1860), 2 ed. 9. BERK. Handb. br. m. 303 (1863). LINDB. de Tort. 215 (1864). MILDE Bry. siles. 90 (1869). JAEG. Ber. St. Gall. gesells. 1869, p. 73. JURATZ. Laubm. oester.-ung. 5 (1882).

Ephemerum recurvifolium LINDB. Musc. scand. 22 (1879).

Dioicous; with dull green, much-branched protonema. Leaves erecto-patent, flexuose, curved, spreading backward towards apex, elongated, lineal-lingulate, eroso-denticulate at apex; nerve strong, excurrent in an apiculus or vanishing; cells at base elongated hexagono-rectangular, hyaline, above denser, rhombic, chlorophyllose. Caps. on a very short pedicel, subglobose, rostellate, rufous brown, pachydermous; cal. campanulate, split on one side nearly to top, vaginula oblong; spores granular, fuscous. Male plant gemmiform.

HAB.—Fields and by ditches, rare. Fr. 10—12.

Near Croydon (*Dickson*)! Bedford purlieus, Wansford (*Berkeley* 1827)! Hurstpierpoint (*Mitten* 1846)!! Near Marsden, Durham (*Bowman* 1840)! Ditchling, Sussex (*Davies* 1869)!! Buckingham (*Holmes* 1876)!! Wrotham, Kent (*Holmes*).

The calyptra is so variable in the different species, that it is quite insufficient to characterize a separate genus *Ephemerella*.

2. ACAULON C. MUELL.

(Bot. Zeit. 1847, p. 99.)

Plants minute, gemmiform, gregarious. Capsule immersed, globose, not apiculate. Calyptra conic, very small, resting only on the top of caps. torn irregularly. Columella thick. Spores minutely granulose. Leaves tristichous, upper very large, concave, connivent.—Der. α neg. καυλος a stem.

CLAVIS TO THE SPECIES.

Perich. bracts convolute, nerve vanishing at point.	*muticum.*
——— —— boat-shaped, carinate, nerve excurrent.	*triquetrum.*

1. ACAULON MUTICUM (*Schreb.*) *C. Muell.*

Autoicous; bracts broadly oval, concave, subconvolute, the nerve vanishing in apex. Caps. erect on a straight pedicel. (T. XXVII, G.)

SYN.—*Phascum acaulon* β. *minus* L. Sp. pl. 1570 (1753). HUDS. Fl. angl. 397 (1762). WEISS Cr. goett. 267 (1770). EHRH. Han. mag. 1780, p. 235.

Phascum muticum SCHREB. de Phasco obs. 8, excl. syn. t. 1, fgg. 11-14 (1770); Spic. fl. lips. 73 (1771). WEB. Spic. Fl. goett. 126 (1778). HEDW. Fund. musc. II, 85 (1782), Sp. musc. 23 (1801). ROTH. Fl. germ. i, 452 (1788). TIMM Fl. meg. n. 719 (1788). JACQ. Collect. ii, 215 (1788). SWARTZ Musc. suec. 18 (1799). HOFFM. Deutsch. Fl. ii, 21 (1795). WITH. Bot. arr. br. Veg. 3 ed. iii, 784 (1796). HULL Br. fl. P. 2, 251 (1799). BRID. Musc. rec. II, P. I, 10 (1798), Sp. musc. I, 1 (1806), Mant. 4 (1819), Bry. univ. i, 22 (1826). ROEHL. Moosg. deutsch. 15 (1800), Deutsch. fl. iii, 32 (1813), Ann. wett. ges. i, 187. SM. Fl. br. iii, 1156 (1804). Eng. bot. t. 2027. TURN. musc. hib. 3 (1804). P. BEAUV. Prodr. 82 (1805). SCHULTZ Fl. starg. 271 (1806). WEB. MOHR Bot. Tasch. 69 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 10, t. 4 (1810). SCHWAEG. Suppl. I, P. I, 2 (1811). MART. Fl. cr. erl. 125 (1817). HOOK. TAYL. Musc. br. 8, t. 5 (1818). FUNCK Moost. 2, t. 1 (1821). GRAY Nat. arr. br. pl. i, 712 (1821). HOOK. Fl. scot. P. II, 122 (1821); Br. flora ii, 3 (1833). NEES HORNSCH. Bry. germ. i, 46, t. 5, f. 6 (1823). BR. SCHIMP. Bry. eur. fasc. 1, p. 8, t. 2 (1837). HUEBEN. Musc. germ. 8 (1833). RABENH. Deutsch kr. fl. ii, s. 3, 81 (1848). WILS. Bry. br. 29, t. 5 (1855). MACK. Fl. hib. P. 2, 8 (1836). HOBK. Syn. br. m. 27 (1873). HUSN. mouss. nord-ouest. 34 (1873).

Phasc. bulbosum VOIT Musc. herb. 8 (1812). DE NOT. Syll. musc. 305 (1838).

Ephemerum muticum HAMPE in Flora xx, P. I, 285 (1837).

Acaulon muticum C. MUELL. in Bot. zeit. v, 99 (1847). Syn. musc. i, 22 (1849). BR. SCHIMP. Bry. eur. fasc. 42, Suppl. mon. 3, t. 1 (1849). JAEG. Ber. St. Gall. ges. 1869, p. 75. HUSN. Mousses n. o. 2 ed. 57 (1882).

Schistidium muticum MITT. in Ann. mag., Nat. Hist. 1851, p. 311.

Sphærangium muticum SCHIMP. Synops. 13 (1860). BERK. Handb. br. m. 302 (1863). LINDB. de Tort. 216 (1864). MILDE Bry. siles. 91 (1869). JURATZ. Laubm. oester.-ung. 88 (1882). LESQ. JAMES Mosses N. Amer. 40 (1884).

Autoicous; dull green gregarious, gemmiform, oblong conic, rounded-triangular. Leaves few, broadly ovate, very concave, undulated; perich. bracts two, much larger, subconvolute, not keeled, suddenly narrowed into an eroso-denticulate point, nerve vanishing at

apex or slightly excurrent, margins plane, cells at base large, rhombo-hexagonal, smaller and incrassate above. Calyptra very small, lacerate at base, corrugated by drying. Capsule concealed in perich. on a straight pedicel, erect, globose, pachydermous, orange-brown; spores yellow-brown, tuberculate. Male infl. gemmiform, on a short basal branch.

HAB.—Sandy clay in open grassy places; not uncommon. Fr. 2—3.

Var. β. **minus.** (*Hook. Tayl.*)

Plants smaller; bracts more shortly pointed, entire, scarce exceeding the capsule, which is smaller.

SYN.—*Phascum globosum* SCHLEICH. MSS.

Phasc. muticum β. *minus* HOOK. TAYL. Musc. br. 7. BRID. Bry. un. i, 23.

Sphaerangium muticum β. *minus.* SCHIMP. Synops.

Acaulon minus JAEG. Op. c. 78.

HAB.—Sea coast. Torquay (*Hooker*)! Findon, Sussex (*Davies* 1869)!!

From its short duration and concealed capsule this little moss is doubtless often overlooked; not unfrequently it has a rufous brown tinge. Although Dillenius's *Sph. acaulon* &c. *minus* is represented in his herbarium by a small form of *Phascum acaulon*, there is little doubt but the early authors also included the present plant.

2. ACAULON TRIQUETRUM (*Spruce*) *C. Muell.*

Autoicous; bracts broadly oval, trifarious, carinate, boat-shaped, connivent, nerve excurrent in a recurved apiculus. Caps. horizontal on a cygneous pedicel. (T. XXVII, H.)

SYN.—*Phascum muticum* MOUG. NESTL. Stirp. cr. Vog. rhen. n. 802. DRUMM. Musc. Amer. n. 8 p.p.

Phascum bulbosum Var. γ. *minimum* DE NOT. Syllab. 306 (1838).

Phasc. triquetrum SPRUCE in Eng. bot. suppl. t. 2901 (1845). et in HOOK. Lond. Journ. bot. iv. 189 (1845). RABEN. Deutsch. kr. fl. ii, P. 3, 81 (1848). WILS. Bry. brit. 29, t. 37 (1855). DE NOT. Epil. bri. ital. 737 (1869). HOBK. Syn. br. m. 27 (1873).

Acaulon triquetrum C. MUELL. in Bot. Zeit. v, 100 (1847). Synops. i, 22 (1849). BR. SCH. Bry. eur. fasc. 42, Mon. suppl. 3, t. 1 (1849). JAEG. Ber. St. Gall. ges. 1869, p. 76.

Schistidium triq. MITT. in Ann. mag. Nat. hist. 1851, p. 311.

Sphærangium triq. SCHIMP. Synops. 14 (1860). BERK. Handb. br. m. 302 (1863). MILDE Bry. siles. 92 (1869). LINDB. de Tort. 216 (1864). JURATZ. Laubm. oester.-ung. 89 (1882). LESQ. JAMES Mosses N. Amer. 41 (1884).

Autoicous; pale rufescent, densely gregarious, bulbilliform, triquetrous, often with a little fine protonema. Lower leaves very small, nerveless; upper obovate, apiculate, very concave; perich. bracts three, very large, broadly obovate, acutely carinate, boat-shaped, connivent, the margin recurved and eroso-denticulate toward apex, nerve excurrent in a recurved apiculus, cells lax, rectangular at base, rhomboidal at apex. Calyptra very small, dilated and irregularly torn at base, caps. on a cygneous pedicel, horizontal, globose, immersed, rufous; spores

fuscescent. Male infl. basal, gemmiform, bracts obovate-lanceolate, nerveless.

HAB.—Bare places among short grass on the south coast; rare. Fr. 2—4.

Cliff between Rottingdean and Newhaven (*Borrer* 1844)!! near Brighton (*Mitten*)!!

3. PHASCUM (L.) SCHREB.

(De Phasco Obs. (1770).)

Plants very small, pottioid, gregarious, with a short erect stem. Leaves nerved, ovate or lanceolate, entire, comant, the cells rhombo-hexagonal, denser above, usually papillose. Calyptra cucullate. Capsule on a very short pedicel, immersed or somewhat exserted, subglobose or ovate, obliquely apiculate, astomous, pachydermous; columella perfect. Der. φασκον, a name applied by Theophrastus to *Usnea barbata*.

CLAVIS TO THE SPECIES.

Capsule immersed.	
Plants green, leaves oblong connivent.	*acaulon.*
Plants brown, leaves ovate-acuminate patent.	*Floerkei.*
Capsule exserted.	
Leaves lanceolate acuminate, seta arcuate.	*curvicolle.*

1. PHASCUM ACAULON *L.*

Paroicous; stem simple, erect. Leaves ovate and elongato-lanceolate, cuspidate with the excurrent nerve. Caps. subglobose, apiculate, brown. (T. XXVII, I.)

SYN.—*Muscus trichoides acaulos minor latifolius.* DOODY, MERR. Pinax 86 (1667). RAY Syn. stirp. br. 2 ed. app. 324 (1696).

Sphagnum acaulon foliis in bulbi formam congestis majus DILL. Cat. Giss. 230 (1719), et in RAY Synops. 3 ed. 105 (1724). Hist. musc. 251, t. 32, f. 11 (1741), et Herb.

Sphag. acaulon foliis in bulbi formam congestis minus DILL. Cat. Giss. l. c. et in RAY Syn. l. c. Hist. musc. 252, t. 32, f. 12, et Herb.

Phascum acaulon L. Sp. plant. ii, 1106 (1753). HUDS. Fl. angl. 396 (1762). WEISS Cr. goett. 266 (1770). WITH. Bot. arr. br. veg. ii, 660 (1776). LIGHTF. Fl. scot. ii, 693 (1777). Fl. Dan. t. 249, f. 3. CURT. Fl. Lond. t. 66 (1778). RELH. Fl. cant. 395 (1785). HULL Br. fl. P. 2, 251 (1799). LINDB. de Tort. 217 (1864). MITT. Journ. Lin. Soc. xii, 141 (1869).

Phascum cuspidatum SCHREB. de Phasco 8, t. l. fgg. 1—5 (1770), Spic. Fl. lips, 73 (1771), WEB. Fl. goett. 125 (1778). ROTH Fl. germ, i, 452 (1788), iii, P. I, 111. SCHRANK Baiers. fl. ii, 432 (1789) SIBTH. Fl. oxon. 273 (1794). LAICH. Pl. eur. 471 (1794). HOFFM. Deutsch. fl. ii, 19 (1795). BRID. Musc. rec. II, P. I, 17 (1798), Sp. musc. I, 8 (1806), Mant. 8 (1819), Bry. univ. i, 41 (1826). SWARTZ Musc. suec. 18 (1799). ABBOT Fl. bedf. 229 (1798). ROEHL. Moosg. deutsch. 29 (1800), Ann. Wett. ges. i, 187 (1809), Deutsch. fl. iii, 33 (1813). HEDW. Sp. musc. 22 (1801). SM. Fl. brit. iii, 1155 (1804), Eng. Bot. t. 2025. TURN. Musc. hib. 3 (1804). P. BEAUV. Prodr. 82 (1805). SCHULTZ Fl. starg. 274 (1806). WEB. MOHR Bot. Tasch. 68 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 8, t. 3 (1810). SCHWAEG. Suppl. I, P. I, 2 (1811). VOIT Musc. herb. 3 (1812). LA PYL. Journ. Bot. 1813, p. 273, t. 19. WAHLEN. Fl. carpat. 333 (1814), Fl. upsal. 392 (1820). MART. Fl. cr. erl. 125 (1817). HOOK. TAYL. Musc. br. 8, t. 5 (1818). HARTM. Skand. fl. 379 (1820). HOOK. Fl. scot. P. 2, 122 (1821), Br. fl. ii, 4 (1833). GRAY Nat. arr. br. pl. i, 712 (1821). ZENK. DIETR. Musc. thuring. Fasc. 2, n. 49 (1822). NEES HORNSCH. Bry. germ. i, 70, t. 7. f. 18 (1823). HUEBEN. Bry. germ. 15 (1833). MACK. Fl. hibern. P. II, 8 (1836). BR. SCHIMP. Bry. eur. Fasc. 1, p. 10, t. 4 (1837), et fasc. 43

(1850). DE NOT. Syllab. 304 (1838), Epil. bri. ital. 756 (1869). FIEDL. Syn. Laubm. meckl. 39 (1844). RABENH. Deutsch. kr. fl. ii, S. 3, 82 (1848). C. MUELL. Syn. i, 25 (1849). WILS. Bry. brit. 31, t. 5 (1855). SCHIMP. Synops. 16 (1860). BERK. Handb. br. m. 299 (1863). MILDE Bry. siles. 93 (1869). JAEG. Ber. St. Gall. ges. 1869, p. 79. HOBK. Syn. br. m. 28 (1873). HUSN. Mouss. nord-ouest 34 (1872). JURATZ. Laubm. oester.-ung. 15 (1882). LESQ. JAMES Mosses N. Amer. 42 (1884).

Bryum bulbiforme NECK. Meth. musc. 230 (1771).

Phascum acaulon β. *majus* EHRH. Hann. mag. 1780, p. 235.

Pottia cuspidata MITT. Ann. n. h. 2. ser. viii, 311 (1851).

Paroicous; cæspitose and gregarious, deep green. Stem 1—4 lines high, erect, simple or divided, occasionally flagelliferous. Leaves crowded, lowest minute, lanceolate, upper comant, much larger, oblongo-lanc. nerve more or less excurrent in a rufous point, margin quite entire, subrevolute in the upper half; areolation lax, elongate rhombic and hyaline at base, subquadrate and chlorophyllose at apex, minutely papillose. Caps. usually several on the same plant, on a very short straight pedicel, immersed, or on a curved pedicel emerging laterally, globose, apiculate, rufo-castaneous; cal. cucullate, pale, reaching middle of caps. Spores fuscous, very finely granular. Male in axils of comal leaves, with one bract and few antheridia.

Hab.—On clay in stubble fields and banks; common. Fr. 1—3.

Var. β. **piliferum** (*Schreb.*).

Smaller; leaves crowded, subconnivent, rufescent, the nerve excurrent in a long filiform point; caps. large, immersed.

SYN.—*Phascum piliferum* SCHREB. de Phasco 8, t. 1, fgg. 6—10. DICKS. Crypt. fasc. II, 1. TIMM. Fl. meg. n. 717. HOFFM. ii, 19. SWARTZ. M. suec. 17. HULL Br. fl. 252. ROTH Germ. iii, 110. HEDW. Sp. musc. 20. SM. Fl. brit. 1151; Eng. Bot. t. 1888. BRIDEL, SCHULTZ, WEB. MOHR, &c. NEES HORNSCH. Bry. germ. 65, t. 6.

Phas. cuspidatum β. *pilifcrum* HOOK. TAYL. Musc. br. 8.

HAB.—Bare sandy ground, especially by the sea, in uniform patches.

Yarmouth (*Turner*)! Cobham, Kent (*Braithwaite* 1850)!! Penzance (*Curnow*)!! Crosby (*Marratt* 1860)! Middleton, Sussex (*Davics* 1864)! Blackhead, Belfast (*Stewart* 1884)!!

Var. γ. **Schreberi** (*Dicks.*) *Brid.*

Stem tall, repeatedly divided above; leaves longer, distant, the comal patent; capsule emerging.

SYN.—*Phascum Schreberianum* DICKS. Crypt. fasc. IV, 2. SM. Fl. br. 1155; Eng. Bot. t. 2026. ROEHLING.

Phas. cusp. β. *Schreberianum* BRID. Sp. musc. I, 9; Mant. 8; Bry. univ. i, 42. NEES HORNSCH. Bry. germ. i, 72, t. 7, f. 18.

Phasc. affine NEES HORNSCH. Bry. germ. 74, t. 7, fig. 19.

HAB.—On rich damp soil.

Brighton (*Borrer*)!! Darlington (*Backhouse*).

Var. δ. **curvisetum** (*Dicks.*).

Stem tallish, generally divided; leaves erecto-patent, aristate; caps. emerging on a geniculate pedicel.

SYN.—*Phascum curvisetum* DICKS. Crypt. fasc. IV, 2, t. 10, f. 4. SM. Fl. br. 1154; Eng. Bot. t. 2259. TURN. Musc. hib. BRID. Sp. musc.

Phasc. elatum BRID. in Schrad. Journ. 1800, II, 269; Bry. univ. i, 45. WEB. MOHR Bot. Tasch. 68. SCHWGN. Suppl. I, P. I, 8, t. 1. NEES HSCH. Bry. germ. 1, 75, t. 7, f. 20.

Phas. cusp. γ. *curvisetum* NEES HSCH. Bry. germ. i, 72, t. 7, f. 18**. BRID. Bry. univ. i, 42.

HAB.—On heaths, not common.

Croydon (*Dickson*). Bedford (*Abbot*). Henfield (*Davies* 1868)!! Coleshill Heath (*Bagnall*).

This common moss varies much in size, so that numerous forms are met with. The greatest deviation from its ordinary aspect is when it throws out several innovations and becomes branched from the base.

2. PHASCUM FLOERKEI *Web. Mohr.*

Paroicous; leaves ovate, gradually acuminate, patulous, margin revolute, entire, nerve thick excurrent. Caps. rostellate. (T. XXVII, K.)

SYN.—*Phascum Floerkeanum* WEB. MOHR Bot. Tasch. 70 & 451 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 5, t. 2 (1810). SCHWAEGR. Suppl. I, P. I, 3, t. 3 (1811). ROEHL. Deutsch. fl. iii, 32 (1813). BRID. Mant. 5 (1819); Bry. univ. i, 26 (1826). FUNCK Moost. 2, t. 1 (1821). NEES HORNSCH. Bry. germ. i, 52, t. 5, f. 10 (1823). HUEBEN. Musc. germ. 11 (1833). BR. SCHIMP. Bry. eur. fasc. 1, p. 8, t. 3 (1837). DE NOT. Syllab. 303 (1838), Epil. bri. it. 736 (1869). WILS. Eng. Bot. t. 2887 (1844), Bry. brit. 30, t. 37 (1855). RABENH. Deutsch. kr. fl. ii, s. 3, 80 (1848). HOBK. Syn. br. m. 28 (1873). HUSN. Mouss. nord-ouest. 33 (1873).

Phasc. minutum ROEHL. Ann. wetter. ges. i, 185 (1809).

Acaulon Floerkeanum C. MUELL, in Bot. Zeit. v, 99 (1847); Synops. i, 21 (1848). BRUCH SCHIMP. Bry. eur. fasc. 42, t. 2 (1849).

Schistidium Floerk. MITT. in Ann. nat. hist. 2 ser. viii, 311 (1851).

Microbryum Floerk. SCHIMP. Synops. 11 (1860). LINDB. de Tort. 216 (1864). JAEG. Ber. St. Gall. ges. 1869, p. 74. JURATZ. Laubm. oester.-ung. 87 (1882). LESQ. JAMES Mosses N. Amer. 45 (1884).

Paroicous; minute, scattered, gemmaceous, rufescent. Leaves erecto-patent, lower very small ovate nerveless, upper ovato-acuminate, concave, somewhat recurved at points, minutely papillose at back towards apex, cuspidate with the stout, reddish, excurrent nerve; margins slightly reflexed above, entire or subcrenulate towards point; basal cells hexagono-rectangular lax pellucid, upper rhombic incrassate. Caps. reddish-brown, immersed, globose-ovate, pachydermous, with a thick obtuse point; cal. somewhat conical, rarely cleft at side, dilated and torn at base; spores pale. Antheridia naked in axils of upper leaves, occasionally in distinct plants on the same protonema, bracts acuminate, ovate nerveless.

HAB.—Clay fields; not common. Fr. 11—2.

Durham coast between Sunderland and S. Shields (*Bowman* 1840)!! Ravensworth castle, by the Team (*Thornhill*)! Sussex, Newtimber (*Borrer* 1845)! Hurstpierpoint and Woolsonbury hill (*Mitten* 1845)!! Aldrington (*Davies* 1856)!! Castle Howard (*Spruce*). Conway (*Wilson* 1861)!! Llansaintfraid (*Wilson* 1864). Wolvercott, Oxford (*Boswell* 1867)!!

Var. β. **badium** (*Voit*) *Brid.*

Leaves longer, narrower, brownish; caps. smaller ovate, badious.

SYN.—*Phascum badium* VOIT Musc. herb. 7 (1812). NEES HORNSCH. Bry. germ. i, 53, t. 5, f. 11. BRID. Bry. univ. i, 27. HUEBEN. l. c. JAEG. op. c. 75.

Phasc. Floerkeanum β. *badium* BRID. Mant. 5.

HAB.—Occasionally found with the typical form.

Bulmer near York (*Spruce* 1844). Hurstpierpoint (*Mitten*)!!

3. PHASCUM CURVICOLLE *Ehrh.*

Paroicous ; leaves crowded, ovato-lanceolate, denticulate and pale at tip. Caps. ovate, acuminate, purple, cernuous on an arcuate pedicel. (T. XXVIII, A.)

SYN.—*Phascum curvicollum* EHRH. MSS. et Beitr. iv, 44 (1789). HEDW. St. crypt. i, 31, t. 11 (1787) ; Sp. musc. 21 (1801). ROTH Fl. germ. i, 452 (1788), iii, P. I, 114. DICKS. Crypt. fasc. II, 1 (1790). SCHRAD. Fl. germ. 58 (1794). RELH. Fl. Cant. Suppl. 3, p. 8 (1795). WITH. Bot. arr. br. veg. 3 ed. iii, 786 (1796). HOFFM. Deutsch. Fl. ii, 26 (1795). ABBOT Fl. bedf. 230 (1798). BRID. Musc. rec. II, P. I, 11 (1798) ; Sp. Musc. I, 2 (1806) ; Mant. 5 (1819) ; Bry. univ. i. 24 (1826). HULL Br. fl. P. 2, 251 (1799). ROEHL. Moosg. deutsch. 17 (1800) ; Ann. Wett. ges. i, 187 (1809) ; Deutsch. fl. iii, 33 (1813). SM. Eng. Bot. t. 905 (1801) ; Fl. brit. 1153 (1804). P. BEAUV. Prodr. 82 (1805). WEB. MOHR Bot. Tasch. 65. t. 6, f. 1 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 4, t. 1 (1810). SCHWAEG. Suppl. I, P. I, 7 (1811). VOIT Musc. herb. 6 (1812). LA PYL. Journ. Bot. 1813, 279, t. 19, f. 9. HOOK. TAYL. Musc. brit. 9, t. 5 (1818). FUNCK Moost. 2, t. 1 (1821). GRAY Nat. arr. br. pl. i, 712 (1821). NEES HORNSCH. Bry. germ. i, 55, t. 5, f. 12 (1823). HARTM. Skand. fl. 380. HUEBEN. Musc. germ. 13 (1833). HOOK. Br. fl. ii, 4 (1833). MACK. Fl. hib. P. 2, 8 (1836). BR. SCHIMP. Bry. eur. fasc. 1, p. 11, t. 4 (1837) ; et f. 43, t. 2. DE NOT. Syll. 302 (1838), Epil. 735 (1869). C. MUELL. Synops. i, 27 (1849). RABENH. Deutsch. kr. fl. ii, P. 3, 83 (1848). WILS. Bry. br. 30, t. 5 (1855). SCHIMP Synops. 19 (1860). LINDB. de Tort. 217 (1864). JAEG. Ber. St. Gall. nat. ges. 1869, p. 82. MILDE Bry. siles. 93 (1869). HOBK. Syn. br. m. 28 (1873). HUSN. Mouss. nord-ouest. 35 (1873). JURATZ. Laubm. oester.-ung. 90 (1882).

Phasc. cernuum GMEL. in L. Syst. nat. 13 ed. ii, P. II, 1323 (1791).

Pottia curvicollis MITT. in Ann. Mag. Nat. hist. 1851, p. 311.

Cycnea curvicolla BERK. Handb. br. m. 301 (1863).

Paroicous and synoicous ; short, slender, gregarious or subcæspitant, rufescent. Leaves crowded, erecto-patent, subimbricated, ferruginous green, pale at apex, lower ovate acuminate, upper elongato-lanceolate, cuspidate with the solid rufous excurrent nerve, margin entire, subreflexed, upper cells small hexagonal, chlorophyllose, papillose. Caps. solitary or several in one perich. rufous-purple, oval with a short apiculus, on a pale cygneous pedicel emerging laterally from the perich. leptodermous subpendulous ; cal. pale, reaching below middle of caps., spores pale yellow, faintly papillose.

HAB.—Moist banks and fields ; not common. Fr. 2—4.

Croydon (*Dickson*). Clapham, Beds. (*Abbot*). Audley End, Essex (*Rev. J. Leefe* 1823) ! Newhaven (*Borrer*) ! Burling gap and Goodwood racecourse (*Jenner* 1835) ! Rottingdean (*Davies*) ! ! Hurstpierpoint (*Mitten*) ! Todmorden (*Nowell*) ! ! Pontefract and Castleford (*Dr. Wood*) ! Colwyn (*Palgrave* 1862) ! Dublin. Ilsington, and Catdown, Devon (*Holmes*).

4. POTTIA EHRH.

(Beitraege i, 175 (1787) .)

Plants simple or divided from the base, cæspitose or pulvinate. Leaves broad, enlarging upward, oblong acuminate, soft, opake, usually papillose ; areolation lax, rectangular and hyaline at base, quadrato-hexagonal and chlorophyllose above. Calyptra cucullate. Caps. erect, turbinate or subcylindric, in a few remaining closed, or gymnostomous,

or with a peristome of 16 teeth, rudimentary or imperfect, or flat lanceolate and united at base by a narrow membrane, bipartite, of a double lamina, solid and papillose. Spores granulose. Inhabiting the ground and crevices of rocks.—Der. after Prof. Pott of Brunswick.

This genus is by Mitten and Lindberg regarded as a section of *Tortula*, and the foliage will be seen to approach very closely that of *Desmatodon*, e.g., *Tort. muralis*.

It is perhaps better to keep it separate as it possesses a certain natural habit, and a considerable number of species—nearly 40—which have many points in common, and when a peristome is present, it does not run out into cilia as in *Tortula;* the male infl. must be observed early in the season, as it is often caducous before the maturity of the fruit. I attach considerable importance to the smoothness or scabrosity of the calyptra, as it affords a valuable character to discriminate species, otherwise very closely allied.

CLAVIS TO THE SPECIES.

Lid minute, persistent.	
Capsule globose.	*recta.*
Capsule elliptic, acuminate	*bryoides.*
Lid distinct, deciduous.	
Leaves quinquefarious.	
Nerve not excurrent.	
Leaves divergent serrulate towards apex.	*Heimii.*
Leaves imbricated, entire.	*latifolia.*
Nerve excurrent.	
Calyptra smooth.	
Leaves with upper cells smooth.	
Capsule turbinate.	*truncatula.*
Capsule oval-cylindric.	*littoralis.*
Leaves with upper cells papillose.	
Upper cells larger, peristome none.	*intermedia.*
Upper cells smaller, peristome present.	
Nerve excurrent in a long point.	*lanceolata.*
Nerve forming a short mucro.	*cæspitosa.*
Calyptra scabrous.	
Lid conic obtuse.	*Starkei.*
Lid rostrate.	*asperula.*
Leaves octofarious.	
Calyptra smooth.	
Nerve excurrent in a short point.	*viridifolia.*
Nerve excurrent in a long point.	*crinita.*
Calyptra scabrous.	*Wilsoni.*

1. POTTIA RECTA (*With.*) *Mitt.*

Paroicous; leaves broader, oblongo-lanceolate, papillose at back. Capsule subglobose, exserted on an erect pedicel; lid distinct, persistent; cal. rough at point. (T. XXVIII, B.).

SYN.—*Phascum curvicollum* SM. Eng. Bot. t. 330 (1796).

Phascum rectum WITH. Bot. arr. Br. veg. 3 ed. iii, 787, t. 18, f. 1 (1796). HULL Br. Fl. P. 2, 252 (1799). SM. Eng. Bot. sub t. 905 (1801); Fl. brit. 1153 (1804). TURN. Musc. hib. 4 (1804). BRID. Sp. musc. I, 2 (1806); Mant. 6 (1819); Bry. univ. i. 25 (1826). SCHWAEG. Suppl. I, P. I, 11 (1811). LA PYL. Journ. Bot. 1813, p. 279. HOOK. TAYL. Musc. br. 9, t. 5 (1818). GRAY Nat. arr. br. pl. i, 712 (1821). HOOK. Br. fl. ii, 4 (1833). HUEBEN. Musc. germ. 12 (1833). BR. SCHIMP. Bry. eur. fasc. I, p. 11, t. 5 (1837), et fasc. 43, t. 2. DE NOT. Syll. 302 (1838); Epil. bri. ital. 734 (1869). RABENH. Deutsch. kr. fl. ii, S. 3, 83 (1848). C. MUELL. Synops. i, 27 (1849). WILS. Bry. br. 31, t. 5 (1855). SCHIMP. Synops. 20 (1860). JAEG. Ber. der St. Gall. nat. ges. 1869, p 82. HOBK Syn. br. m. 28 (1873). HUSN. Mouss. nord-ouest. 35 (1873). JURATZ. Laubm. oester.-ung. 91 (1882).

Pottia recta MITT. Ann. nat. hist. 2 ser. viii, 311 (1851). LINDB. in Oefv. vet ak. foerh, xx, 410 (1863); de Tort. 218 (1864).

Bryella recta BERK. Handb. br. m. 300 (1863).

Tortula recta LINDB. Musc. scand. 21 (1879).

Paroicous; plants very dwarf, densely gregarious, dull green or rufescent. Leaves crowded, erecto-patent, papillose above, oblongo-lanceolate, concave, the margins revolute, nerve excurrent; cells at base narrowly rectangular, above hexagonal. Caps. erect, subglobose, apiculate, nitidulous, reddish-orange, often 2—3 in one perichætium, the lid minute, with a simple annulus, not separating; cal. yellow-brown, the beak rough with minute papillæ, black at apex; spores pale, rough.

HAB.—Fields on clay and calcareous soil, and banks by roadsides; not common. Fr. 2—3.

Sussex and Kent, frequent. Plymouth (*Holmes* 1867)!! Llangollen (*Kent* 1865)!! Beaumaris (*Hunt*)!! Manchester and Pontefract (*Hunt* 1867)!! Levens (*Barnes* 1869)!! Todmorden. Dublin (*Moore*). Near York (*Spruce*).

2. POTTIA BRYOIDES (*Dicks.*) *Mitt.*

Autoicous; leaves patent, accrescent upward, oblongo-lanceolate, reflexed at margin, aristate with the excurrent nerve. Caps. elliptic-ovate, subobliquely rostrate; lid persistent; cal. smooth. (T. XXVIII, C.)

SYN.—*Phascum bryoides* DICKS. Crypt. fasc. IV, 3, t. 10, f. 3 (1801). SM. Fl. brit. iii, 1154 (1804); Eng. Bot. t. 1280. WEB. MOHR Bot. Tasch. 65 (1807). ROEHL. Ann. Wett. ges. i, 193 (1809); Deutsch fl. iii, 34 (1813). SCHKUHR Deutsch kr. gew. P. 2, 6, t. 2 (1810). SCHWAEG. Suppl. I, P. I, 8, t. 2 (1811). VOIT Musc. herb. 1 (1812). HOOK. TAYL. musc. br. 8, t. 5 (1818). SCHULTZ Suppl. Fl. Starg. 63 (1819). FUNCK Moost. 3, t. 1 (1821). GRAY Nat. arr. br. pl. i, 712 (1821). NEES HORNSCH. Bry. germ. i, 76, t. 7, f. 21 (1823). HUEBEN. Musc. germ. 17 (1833). HOOK. Br. fl. ii, 4 (1833). BR. SCHIMP. Bry. eur. fasc. 1, p. 11, t. 5 (1837); et fasc. 43, t. 2. DE NOT. Syllab. 301 (1838); Epil. bri. ital. 734 (1869). RABENH. Deutsch. kr. fl. ii, S. 3, 83 (1848). C. MUELL. Synops. i, 28 (1849). WILS. Bry. brit. 33, t. 5 (1855). SCHIMP. Synops. 18 (1860). BERK. Handb. br. m. 300, t. 24, fig. 8 (1863). JAEG. Ber. der St. Gall. nat. ges. 1869, p. 80. HOBK. Syn. br. m. 29 (1873). HUSN. Mouss. nord-ouest. 34 (1873). JURATZ. Laubm. oesterr.-ung. 90 (1882). LESQ. JAMES Mosses N. Amer. 42 (1884).

Phascum gymnostomoides BRID. Sp. musc. I, 7 (1806); Mant. 7 (1819); Bry. univ. i, 48 (1826).

Phasc. graniferum WAHL. In Vet. akad. nya handl. xxvii, 131, t. 4, f. 3 (1806).

Phasc. elongatum SCHULTZ Fl. starg. 273 (1806).

Phasc. pusillum SCHLEICH.

Pottia bryoides MITT. Ann. nat. hist. 2 ser. viii, 311 (1851). LINDB. in Oefv. vet. ak. foerhandl. xx, 409 (1863); de Tort. 221 (1864). MILDE Bry. siles. 98 (1869).

Tortula bryoides LINDB. Musc. scand. 21 (1879).

Autoicous; gregarious, cæspitulose, olivaceous green, $\frac{1}{3}$—$\frac{1}{2}$ in. high, simple or sparingly branched. Lower leaves very small, patent, remote, ovato-lanc. upper crowded in an erect coma, much larger, ovate and oblongo-lanc. cuspidate with the solid excurrent nerve, concave, reflexed at margin; areolat. at base oblongo-hexag. hyaline, at apex rounded-hexag. chlorophyllose. Caps. on a straight reddish seta, sometimes

only just emerging from the leaves, ovate or ovato-elliptic, attenuated in an oblique rostellum, fuscous; cal. cucullate, reaching to middle of caps. lid conical paler not separating; spores fuscous, nearly smooth.

Male infl. gemmiform, in axils of upper leaves, bracts broadly ovate, acuminate, outer with an excurrent nerve, vanishing in the inner ones.

HAB.—Fallow fields and banks; rare. Fr. 1—3.

Near Croydon (*Dickson*). Downs at Piecombe, Lewes and Devil's Dyke (*Borrer*). Coast at Aldrington and Cliff E. of Brighton (*Mitten*). Gateshead Fell (*Thornhill*). Mapperley hills, Darlington (*Backhouse*). Ganthorpe, Yorks. (*Spruce* 1841). Bury St. Edmunds (*Eagle*). Norwich! Nottingham (*Valentine*). Buxton (*Dr. Wood* 1865)! Iffley, Oxford (*Boswell* 1861)! ! Woolsonbury hill (*Davies* 1867)! ! Dovedale (*Fraser* 1866)! ! Elie, Fife (*Howie* 1867)! Whitbarrow, Lyth and Levens Park (*Barnes* 1872)! ! Arnside Towers, on old ant hills (*Barnes* 1872)! Howth (*Orr*).

Var. *β.* **Thornhillii** (*Wils.*).

Leaves patulous, spathulato-lanceolate, subreflexed, margins plane, nerve subexcurrent; caps. elliptic, rostrate, pedicel elongated.

SYN.—*Phascum bryoides var. Thornhillii* WILS. Bry. brit. 33.

HAB.—Old stubble fields near Newcastle (*Thornhill* 1841)!

Pottia bryoides has a peculiar looking capsule, much resembling that of *Voitia hyperborea*, but with a distinct persistent lid. Several varieties are enumerated which appear to me to be forms passing into each other, thus Mr. Davies' specimens are midway between the ordinary state and Var. *piliferum*, but the Var. *Thornhillii* is very different and Mr. Wilson suggests may be a distinct species.

3. **POTTIA HEIMII** (*Hedw.*) *Fuernr.*

Autoicous; taller; leaves ovate oblong, acuminate, serrate at apex, laxly areolate, nerve vanishing or continuous; caps. truncate obovate, lid obliquely rostrate, systylious. (T. XXVIII, D.)

SYN.—*Gymnostomum Heimii* HEDW. Stirp. cr. i, 80, t. 30 (1787); Sp. musc. 32 (1801). ROTH Fl. germ. i, 653 (1788), et iii, P. I, 123. HOFFM. Deutsch. fl. ii, 28 (1795). BRID. Musc. rec. II, P. I, 41 (1798), Sp. musc. I, 32 (1806), Mant. 15 (1819); Bry. univ. i, 71 (1826). ROEHL. Moosg. deutsch. 77 (1800); Deutsch. fl. iii, 39. SM. Fl. br. iii, 1162 (1804); Eng. Bot. t. 1951. TURN. Musc. hib. 9 (1804). P. BEAUV. Prodr. 59 (1805). WEB. MOHR Bot. Tasch. 87 (1807). SCHKUHR Deutsch. kr. gew. P. 2, p. 24, t. 11 (1810). SCHWAEG. Suppl. I, P. I, 21 (1811). HOOK. TAYL. Musc. br. 12, t. 7 (1818). FUNK Moost. 6, t. 4 (1821). GRAY Nat. arr. br. pl. i, 715 (1851). HOOK. Fl. Scot. P. II, 123 (1821), Br. fl. ii, 9 (1833). HUEBEN. Musc. germ. 42 (1833). MACK. Fl. hib. P. 2, 10 (1836).

Bryum Heimii DICKS. Crypt. fasc. II, 4 (1790). GMEL. Syst. Nat. ii, 1333 (1791). LAICH. Pl. eur. 482 (1794). WITH. Bot. arr. br. veg. 3 ed. iii, 815 (1796). HULL. Br. fl. P. 2, 257 (1799).

Gymnost. obtusum (haud HEDW.) TURN. op. c. 9, (excl. syn.) t. 1, fig. g-i. Eng. Bot. t. 1407. BRID. Bry. un. i, 72.

Gymnost. systylium FUNK MSS.

Gymnost. affine NEES HORNSCH. Bry. germ. i, 140, t. 9, f. 9 (1823). BRID. Bry. un. i, 72. WAHLENB. Fl. suec. 772. HUEBEN. Musc. germ. 41.

Pottia Heimii FUERNR. in Flora xii, P. II, Erganz. 10 (1829). BRUCH SCHIMP. Bry. eur. fasc. 18—20, p. 12, t. 7 (1843). RABENH. Deutsch. kr. fl. ii, s. 3, 97 (1848). C. MUELL. Synops. i, 551 (1849). WILS. Bry. brit. 96, t. 7 (1855). SCHIMP. Synops. 125 (1860), 2 ed. 155 (1876). BERK. Handb. br. m. 271, t. 23, f. 3 (1863). MILDE Bry. siles. 97

(1869). DE NOT. Epil. Bri. it. 587. LINDB. de Tort. 221 (1864). MITT. Journ. Bot. 1871, p. 4. HUSN. Mousses nord-ouest. 65 (1873). HOBK. Syn. br. m. 57 (1873). JURATZ. Laubm. oester.-ung. 94 (1882). LESQ. JAMES Mosses N. Amer. 102 (1884).

Pottia affinis FUERNR. l. c.

Tortula Heimii MITT. Journ. Lin. Soc. Bot. xii, 165 (1869). LINDB. Musc. scand. 21 (1879).

Autoicous and synoicous; cæspitose, pale yellow-green, more or less branched. Lower leaves remote, broadly lanceolate, upper larger crowded, concave, broadly elongato-lanc. acuminate, acute, serrate at apex; nerve reddish, vanishing in the point or slightly excurrent; margin plane, cells lax, thin pellucid and elongated at base, upper hexagonal, minutely papillose, marginal usually smooth; perich. bracts larger and more acuminated. Caps. on a tall red seta, erect, obovate and oblong, pachydermous, pale olive brown, finally ferruginous and truncate; cal. smooth, pale brown, with a black point; lid from a plano-convex base, longly and obliquely rostrate, when ripe raised on the attached columella; peristome none. Male on a short lateral branch, bracts three, resembling the leaves, rarely synoicous.

HAB.—Moist gravelly banks by the sea and mouths of rivers; not uncommon. Fr. 4—5.

Variable in size, in the length of the seta, capsule and lid, the serration also sometimes becomes obsolete, and the nerve may vanish below the point, at the point, or form an excurrent mucro; it is therefore difficult to define any distinct varieties.

4. POTTIA TRUNCATULA (*L.*) *Lindb.*

Autoicous; laxly cæspitose. Leaves obovate-oblong, acuminate, mucronate with the excurrent nerve; cells above hexagonal, chlorophyllose, smooth. Caps. obovate-spherical, deoperculate subhemispherical; lid rostrate, cal. smooth. (T. XXVIII, E.)

SYN.—*Bryum truncatulum* L. Sp. pl. 1119 (1753). HUDS. Fl. angl. 408 (1762). WEISS Cr. goett. 191 (1770). NECK. Meth. musc. 95 (1771). WITH. Bot. arr. br. veg. ii, 675 (1776). LIGHTF. Fl. scot. ii, 730 (1777). WEB. Spic. fl. goett. 109 (1778). CURTIS Fl. Lond. F. II, t. 71 (1778). Fl. Dan. t. 537. RELH. Fl. cant. 405 (1785). ABBOT Fl. bedf. 242 (1798). HULL Br. fl. P. 2, 258 (1799).

Phascum truncatulum SWARTZ Meth. musc. 25 (1781).

Gymnostomum truncatulum HEDW. Fundam. ii, 87 (1782). TIMM Fl. meg. n. 726 (1788). ROTH Fl. germ. i, 53 (1788). HOFFM. Deutsch. fl. ii, 27 (1795). BRID. musc. rec. II, P. I, 38, t. 1, f. 5 (1798); Bry. univ. i, 67 (1826). ROEHL. Moosg. Deutsch. 67 (1800). SM. Fl. brit. iii, 1158 (1804), Eng. Bot. t. 1975. TURN. Musc. hib. 7, t. 1, fig. d-f. (1804). P. BEAUV. Prodr. 60 (1805). SCHULTZ Fl. starg. 279 (1806). HOOK. TAYL. musc. br. 12, t. 7 (1818). WAHLENB. Fl. ups. 390 (1820). HARTM. Skand. fl. 382 (1820). HOOK. Fl. scot. P. II, 122 (1821), Br. fl. ii, 8 (1833). MACK. Fl. hib. P. 2, 10 (1836).

Gymnost. truncatum HEDW. Stirp. i, 13, t. 5, f. 5-14 (1787), Sp. musc. 30 (1801). SWARTZ Musc. suec. 20 (1799). BRID. Sp. musc. I, 30 (1806), Mant. 15 (1819). SCHKUHR Deutsch, kr. gew. P. II, 21, t. 10 (1810). SCHWAEG. Suppl. I, P. I, 19 (1811). WAHLENB. Fl. carp. 333 (1814). MART. Fl. cr. erl. 120 (1817). SAVI Bot. etrusc. iii, 32 (1818). FUNCK Moost. 6, t. 4 (1821). GRAY Nat. arr. br. pl. i, 715 (1821). NEES HORNSCH. Bry. germ. i, 132, t. 9, f. 6 (1823). HUEBEN. Musc. germ. 39 (1833). DE NOT. Syllab. 285 (1838).

Pottia eustoma β. *minor* EHRH. Beitr. i, 188 (1787).

Bryum truncatum GMEL. in L. Syst. nat. 13 ed. ii, P II, 1334 (1791).

Gymnost. truncatum β. *minus* WEB. MOHR Bot. Tasch. 81 (1807). VOIT Musc. herb. 15 (1812).

Gymnost. circumscissum ROEHL. in Ann. Wett. ges. ii, P. I, 122 (1810), Deutsch. fl. iii, 38 (1813).

Pottia truncata FUERNR. in Flora xii, P. II, Ergang. 10 (1829). BRUCH SCHIMP. Bry. eur. fasc. 18—20, p. 9, t. 4 (1843). FIEDL. Laubm. meckl. 42 (1844). RABENH. Deutsch. kr. fl. ii, s. 3, 97 (1848). WILS. Bry. br. 94, t. 7 (1855). SCHIMP. Synops. 123 (1860), 2 ed. 152 (1876). BERK. Handb. br. m. 270 (1863). MILDE Bry. siles. 97 (1869). DE NOT. Epil. bri. it. 589 (1869). HOBK. Syn. br. m. 55 (1873). HUSN. Mousses nord-ouest. 65 (1873). JURATZ. Laubm. oester.-ung. 92 (1882). LESQ. JAMES Mosses N. Amer. 101 (1884).

Pottia eustoma Var. β. *truncata* HAMPE in Flora xx, P. I, 287 (1837).

Pottia eustoma C. MUELL. Synops. i, 553 (1849).

Pottia truncatula LINDB. de Tort. 220 (1864).

Tortula truncatula LINDB. Musc. scand. 21 (1879).

Autoicous; cæspitose or densely gregarious, simple or dichotomous, deep green. Leaves obovate-oblong and subspathulate, shortly acuminate, mucronate with the excurrent nerve, patent and patulous, widely concave at base, carinate toward apex, plane at margin, soft, smooth; cells at base hexagono-rectang. above large rounded-hexagonal, chlorophyllose. Seta short, reddish; caps. subglobose-turbinate, constricted below the mouth, when empty truncate and nearly hemispherical, fuscous, leptodermous, exannulate; cal. smooth; lid plano-convex, with a longer or shorter oblique beak, falling with the columella attached; spores nearly smooth, brown.

Male infl. gemmiform, in axils of upper leaves, bracts 2—3, ovate-acuminate, nerveless.

HAB.—Fallow ground in fields and gardens and on hedge-banks; common. Fr. 1—3.

This common plant varies considerably in size and in the form of the fruit at maturity and after the lid is cast off, but is easily recognised by the bright green, large celled leaves, and wide mouthed capsule.

5. POTTIA INTERMEDIA (*Turn.*) *Fuernr.*

Resembling *P. truncatula*, but larger. Leaves oblong, apiculate, margin revolute to above middle. Caps. obovate or subcylindric, annulate. (T. XXVIII, F.)

SYN.—*Bryum exiguum creberrimis capsulis rufis*, Var. *major* DILL. Hist. musc. 347, t. 45, f. 7 F-k (1741), et Herbar.

Pottia eustoma Var. *major* EHRH. Beitr. i, 188 (1787). C. MUELL. Synops. i, 554 (1849).

Gymnostomum intermedium TURN. Musc. hib. 7, t. 1, fg. a-c (1804). SM. Fl. brit. iii, 1169 (1804), Eng. Bot. t. 1976. BRID. Sp. musc. I, 31 (1806), Mant. 13 (1819), Bry. univ. i, 69 (1826). SCHWAEG. Suppl. I, P. I, 19, t. 7 (1811). MART. Fl. cr. erl. 124 (1817), SCHULTZ Suppl. Fl. starg. 65 (1819). FUNCK Moost. 6, t. 4 (1821). NEES HORNSCH. Bry. germ. i, 135, t. 9, f. 7 (1823). HUEBEN. Musc. germ. 40 (1833). DE NOT. Syllab. 286 (1838).

Gymnost. truncatum ROEHL. in Ann. Wett. ges. ii, P. I, 122 (1810), Deutsch. fl. iii, 38.

Gymnost. truncatum Var. *majus* WEB. MOHR Bot. Tasch. 81 (1807). VOIT Musc. herb. 15 (1812). WAHLENB. Fl. carp. 333 (1814).

Gymnost. truncatulum var. β. HOFFM. Duetsch. fl. ii, 27 (1795). HOOK. TAYL. Musc. br. 2 ed. 22 (1827).

Pottia intermedia FUERNR. in Flora xii, P. 2, Erganz. 10 (1829). RABENH. Deutsch. kr. fl. ii, S. 3, 97 (1848). DE NOT. Epil. bri. ital. 588 (1869). LINDB. in Journ. Lin. Soc. Botany xi, 461 (1870). JURATZKA Laubm. oester.-ung. 93 (1882).

Pottia eustoma HAMPE in Flora xx, P. I, 287 (1837).

Pottia truncata Var β. *major et* γ. *subcylindrica* BR. SCHIMP. Bry. Eur. fasc. 18—20, p. 9, t. 5 (1843). SCHIMP. Synops. 124 (1860). WILS. Bry. br. HOBK. HUSN.

Pottia lanceolata Var. γ. *subgymnostoma* LINDB. de Tort. 222 (1864).

Pottia lanc. Var. *gymnostoma* SCHIMP. Synops. 2 ed. 158 (1876).

Tortula intermedia LINDB. Musc. scand. 21 (1879).

Autoicous; resembling *P. truncatula*, but larger. Stem erect, longer, lax-leaved below, dense above. Leaves pale green, accrescent upward, erect, subpatulous, oblong, faintly papillose, the perich. bracts oblongo-lanc. narrowed at base, margin more or less revolute above the middle, entire, nerve brown, excurrent in an apiculus; areolation as in *P. truncatula*. Seta pale red or yellow, caps. elliptico-cylindric, constricted below mouth when dry; cal. smooth, cucullate, subulate; lid obliquely rostellate, paler than caps., ann. broad of 2—3 rows of closely adherent cells; a rudimentary peristome often present. Male infl. gemmaceous.

HAB.—Banks and walls, not uncommon. Fr. 12—3.

Cork (*Taylor*). Dublin (*Wilson* 1830) ! ! Henfield (*Borrer* 1836) ! Over, Cheshire (*Wilson* 1844) ! ! Beaumaris (*Sidebotham* 1863) ! Wetherby (*Wesley* 1878) ! ! Newlyn cliff (*Curnow* 1872) ! ! Bodmin (*Tellam* 1878) ! ! Miller's dale (*Holt* 1881) ! !

This does not differ from *P. truncatula* in the form of the capsule only, but we have in addition the presence of an annulus, and papillose leaves with revolute margins. Mitten regards it as a gymnostomous form of *P. lanceolata*, but the areolation is laxer than in that species.

6. POTTIA LITTORALIS *Mitten.*

Autoicous; resembling *P. intermedia*, but with longer leaves; upper cells smaller, quite smooth, the walls much more incrassate. (T. XXVIII, G.)

SYN.—*Pottia littoralis* MITT. Journ. Bot. 1871, p. 4. BRAITHW. Journ. Bot. 1871, p. 290. HOBK. Syn. br. m. 56 (1873).

Autoicous; resembling *P. intermedia*, pale below, green or bluish green above. Leaves much longer, more erect, sheathing at base, more obtuse, with the nerve excurrent in a short point, lower smaller with a longly excurrent nerve; upper cells smaller, quite smooth, with the wall much more incrassate, basal pellucid, very narrow and elongated. Seta pale orange-red, elongated; caps. oblong-oval, slightly narrowed at mouth, ferruginous; cal. smooth; ann. adherent, of one row of cells, lid rostrate, slightly twisted, oblique; spores ferruginous, scarcely rough. Male infl. gemmiform.

HAB.—Sandy ground near the sea; not common. Fr. 2—4.

Aldrington beach, Shoreham and Hastings (*Mitten* 1855)!! Beaumaris (*Hunt* 1871)!! Southport (*Boswell* 1874)!! Tothill, Plymouth (*Holmes* 1872)!

A plant of firmer texture than *P. intermedia* and difficult to define; the areolation of the apical part of the leaf affords the best distinction, but it may be only a variety of the next species.

7. POTTIA LANCEOLATA (*Hedw.*) *C. Muell.*

Autoicous, cæspitulose. Leaves ovato-lanc. acute, revolute; nerve excurrent in a long point. Caps. oval; cal. smooth; lid conico-rostellate; teeth of per. longish, perforated or cleft in the divisural line. (T. XXIX, A.)

SYN.—*Leersia lanceolata* HEDW. Stirp. cr. ii, 66, t. 23 (1789). BRID. Musc. rec. II, P. I, 55, t. 1, f. 8 (1798).

Afzelia lanc. EHRH. Beitr. vii, 4 (1792).

Bryum lanc. DICKS. Crypt. fasc. III, 4 (1793). HOFFM. Deutsch. fl. ii, 31 (1795). P. BEAUV. Prodr. 47 (1805).

Grimmia lanc. SCHRAD. Samml. kr. gew. i, n. 36 (1796), et in USTERI Neu. ann. xiv, 106 (1796). SM. Fl. brit. 1186 (1804), Eng. bot. t. 1408. WEB. MOHR Bot. Tasch. 136 (1807). SCHKUHR Deutsch. kr. gew. P. II, 54, t. 23 (1810). VOIT Musc. herb. 31 (1812).

Anacalypta lanc. ROEHL. Moosg. deutsch. 109 (1800). HARTM. Skand. fl. NEES HORNSCH. Bry. germ. i, 141, T. 36, f. 3 (1823). BR. SCHIMP. Bry. eur. fasc. 18—20, 4, t. 3 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 99 (1848). WILS. Bry. br. 99, t. 14 (1855). DE NOT. Epil. bri. it. 580 (1869). HOBK. Syn. br. m. 57 (1873). SCHIMP. Synops. 128 (1860). BERK. Handb. br. m. 268.

Encalypta lanc. ROTH Fl. germ. iii, P. I, 150 (1800). HEDW. Sp. musc. 63 (1801). TURN. Musc. hib. 19 (1804). BRID. Sp. musc. I, 90 (1806). SCHULTZ Fl. starg. 282 (1806), Fl. dan. t. 1660, f. 2. SCHWAEG. Suppl. I, P. I, 61 (1811). ROEHL. Ann. wett. ges. iii, 163.

Dicranum latifolium TURN. op. c. 79, excl. syn.

Weissia aciphylla WAHLENB. in Vet. ak. nya handl. xxvii, 133, t. 4, f. 1 (1806).

Grim. aciphylla WEB. MOHR op. c. p.p. 137 et 457.

Weissia lanc. ROEHL. Deutsch. fl. 2 ed. iii, 51 (1813). MART. Fl. cr. erl. 113 (1817). HOOK. TAYL. Musc. br. 44, t. 14 (1818). BRID. Mant. 47 (1819). HOOK. Fl. scot. P, II, 130 (1821), Br. fl. ii, 20 (1833). MACK. Fl. Hibern. P. 2, 14 (1836).

Coscinodon lanceolatus, aciphyllus and *connatus* BRID. Mant. et Bry. univ.

Dermatodon lanceolatus HUEBEN. Musc. germ. 112 (1833).

Desmatodon lanc. BRUCH. MSS. DE NOT. Syll. 215 (1838).

Pottia lanceolata C. MUELL. Synops. i, 548 (1849). LINDB. de Tort. 221 (1864). MITT. Journ. Bot. 1871, p. 4. HUSN. Mouss. nord-ouest. 67 (1873). SCHIMP. Synops. 2 ed. 157 (1876). JURATZ. Laubm. oester.-ung. 93 (1882).

Tortula lanceolata LINDB. Musc. Scand. 21 (1879).

Autoicous; in small bright green tufts, simple or branched. Leaves patent, ovato and oblongo-acuminate, carinate-concave, longly cuspidate with the excurrent nerve; margin revolute, reflexed, entire or minutely crenulate at apex from the projecting transverse cell walls; cells nearly smooth, hexagonal and incrassated above, elongated and pellucid at base. Seta orange red, caps. elliptic, rufous-brown; cal. smooth, subulate; ann. broad, simple, lid conico-rostellate, red, shining; teeth of per. on a narrow basal membrane, pale red, erect, linear-lanc. with 8—10 articulations, strongly papillose, entire or cleft or perforated in the divisural line; spores small, fuscous, papillose. Male infl. axillar, gemmiform, bracts 3, broadly ovate.

HAB.—Bare ground, banks and tops of walls, not uncommon. Fr. 2—4.

Surrey, Sussex, Kent, and Derbyshire, frequent.

8. POTTIA CÆSPITOSA (*Bruch.*) *C. Muell.*

Autoicous ; leaves patent, oblong, mucronate, with plane margins, perich. bracts 3, sheathing. Caps. ovate, not tapering at base; lid rostrate, cal. smooth. (T. XXIX, B.)

SYN.—*Weissia cæspitosa* BRUCH MSS. BRID. Bry. univ. i, 808 (1827).

Anacalypta cæsp. FUERNR. in Flora xii, P. II, Erganz. 25 (1829). NEES HORNSCH. Bry. germ. ii, P. II, 146, t. 37, f. 4 (1831). BR. SCHIMP. Bry. eur. fasc. 18—20, 3, t. 2 (1843). RABENH. Deutsch. kr. fl. ii, s. 3, 98 (1848). WILS. Bry. br. 98, t. 41 (1855). SCHIMP. Synops. 127 (1860). BERK. Handb. br. m. 268 (1863). DE NOT. Epil. bri. ital. 581 (1869). HOBK. Syn. br. m. 57 (1873).

Dermatodon cæsp. HUEBEN. musc. germ. 111 (1833).

Desmatodon cæsp. DE NOT. Syll. 203 (1838).

Pottia cæsp. C. MUELL. Synops. i, 547 (1849). LINDB. de Tort. 219 (1864). MITT. Journ. Bot. 1871, p. 4. HUSN. Mous. nord-ouest. 67 (1873). SCHIMP. Synops. 2 ed. 157 (1876).

Autoicous ; densely cæspitulose, simple or branched, yellow-green. Leaves patent, lower ovato-lanc. upper oblong-lanc. concave with plane margins, papillose at back; nerve excurrent in a short mucro; cells minute, incrassate, rectangular at base, rotundo-quadrate above. Perich. bracts 3, erect and sheathing, oblong-acuminate; seta straw-coloured; caps. erect, ovate, often rather asymmetric, not tapering at base, orange-brown; ann. of one row of cells; lid obliquely rostellate red; cal. smooth; teeth of per. on a narrow basal membrane, entire or cleft, irregular, pale. Male infl. gemmiform, bracts ovato-acuminate, nerved.

HAB.—Chalk hills, very rare. Fr. 3—4.

Woolsonbury hill, Sussex (*Mitten* 1846) ! ! Near Arundel (*Davies* 1857) ! !

9. POTTIA STARKEI (*Hedw.*) *C. Muell.*

Paroicous ; cæspitose. Leaves ovato-lanc. nerve excurrent, margin reflexed. Capsule oval, small, calyptra scabrous, lid convexo-conic, obtuse, peristome short, more or less imperfect. (T. XXIX, C.)

SYN.—*Weissia Starkeana* HEDW. Stirp. cr. iii, 83, t. 34 B. (1792), Sp. musc. 65. BRID. Musc. rec. II, P. I, 77 (1798), Sp. musc. I, 117 (1806), Mant. 44 (1819), Bry. univ. i, 553 (1826). ROEHL. Moosg. deutsch. 157 (1800), Deutsch. fl. iii, 50 (1813), Ann. Wett. ges. iii, 108. SCHWAEGR. Suppl. I, P. I, 68 (1811). HOOK. TAYL. Musc. brit. 44, t. 14 (1818). FUNCK Moost. 13, t. 9 (1821). GRAY Nat. arr. br. pl. i, 729 (1821). HOOK. Br. fl. ii, 20 (1833). MACK. Fl. hib. P. 2, 14 (1836).

Bryum Stark. HOFFM. Deutsch. fl. ii, 32 (1795). P. BEAV. Prodr. 49 (1805).

Grimmia Stark. ROTH Fl. germ. iii, P. I, 146 (1800). SM. Fl. brit. 1186 (1804), Eng. Bot. t. 1490. WEB. MOHR Bot. Tasch. 137 (1807). SCHKUHR Deutsch. kr. gew. P. II, 57, t. 24 (1810). VOIT Musc, herb. 32 (1812).

Bryum minutum DICKS. Crypt. fasc. IV, 7, t. 10, f. 17 (1801).

Anacalypta Stark. FUERNR. in Flora xii, P. II, Erganz. 25 (1829). NEES HORNSCH. Bry. germ. ii, P. II, 138, t. 36, f. 2 (1831). BR. SCHIMP. Bry. eur. fasc. 18-20, p. 2, t. 1 (1843). RABENH. Deutsch. kr. fl. ii, s. 3, 98 (1848). WILS. Bry. br. 97, t. 14 (1855). SCHIMP. Synops. 126 (1860). BERK. Handb. br. m. 268 (1863). DE NOT. Epil. bri. ital. 582 (1869). HOBK. Syn. br. m. 57 (1873).

Dermatodon Stark. HUEBEN. Musc. germ. 109 (1833).

Desmatodon Stark. DE NOT. Syll. 205 (1838).

Pottia Stark. C. MUELL. Synops. i, 547 (1849). MITT. in ann. nat. hist. Ser. 2, viii, 312 (1851), Journ. Bot. 1871, p. 3. LINDB. de Tort. 219 (1864). HUSN. Mouss. nord-ouest. 66 (1873). SCHIMP. Synops. 2 ed. 156 (1876). JURATZ. Laubm. oester.-ung. 92 (1882). LESQ. JAMES Mosses N. Amer. 103 (1884).

Pottia mutica VENTURI DE NOT. Epil. bri. ital. 592 (1869).

Tortula Starkei LINDB. Musc. scand. 21 (1879).

Paroicous ; dwarf, cæspitose. Leaves spreading, ovate- and oblongo-lanceolate, papillose above, margin recurved, entire, nerve reddish, excurrent in a short mucro ; cells rectangular at base, opake and hexagonal above. Caps. on an orange seta, minute, oval or oblong, glossy, castaneous, leptodermous ; cal. scabrous ; ann. narrow, persistent ; lid orange, obtuse conic ; teeth flat, linear, obtuse or truncate, of 3—4 artic. entire or perforated, papillose, pale yellow, erect when dry. Antheridia axillary in upper leaves, sometimes covered by a bract.

HAB.—Fallow fields and banks ; not common. Fr. 12—3.

Near Dublin and Cork. Cliffs on Sussex coast and Hurstpierpoint (*Mitten*). Rottingdean (*Davies* 1855)!! Plymouth (*Holmes* 1867)!! Beaumaris (*Hunt* 1871). Buxton (*Hunt* 1872)!! Penzance (*Curnow*).

Var. β. **affinis** (*Hook. Tayl.*)

Leaves longer, paler and more erect ; teeth very short, truncate.

SYN.—*Weissia affinis* HOOK. TAYL. Musc. br. 44, t. 14 (1818). BRID. Bry. un. i, 354. HOOK. Br. fl. 20. GRAY.

Dermatodon aff. HUEBEN. Musc. 110.

Anacalypta aff. FUERNR. l. c.

Anacalypta Stark. β. *brachyodus.* Bry. eur. C. MUELL.

Pottia Stark. Var. β. *brachyoda.* LINDB. de Tort. 219. SCHIMP. Synops. 2 ed.

HAB.—Coast of Sussex, Durham and Anglesea, Dublin.

Var. γ. **Davallii** (*Sm.*) *Lindb.*

Very small ; leaves patulous, becoming red by age, nerve rufous. Caps. ovate, truncate, lid large.

SYN.—*Gymnostomum Davallianum* SM. in KON. SIMS Ann. Bot, i, 577 (1805), et in SCHRAD. Journ. i, 191.

Gymn. rufescens SCHULTZ Fl. starg. 278 (1806). NEES HNSCH. Bry. germ. i, 121, t. 9, f. 1. BRID. Mant, 12. Bry. univ. i, 62.

Gymn. minutulum SCHLEICH. Cat. pl. helv. 29 (1807). WEB. MOHR Tasch. 479. SCHWAEGR. Suppl. I, P. I, 25, t. 9. BRID. Mant. 12 ; Bry. un. i, 61. NEES HORNSCH. SCHIMP. DE NOT. HUEBEN.

Gymn. conicum SCHLEICH. l. c. SCHWAEGR. Suppl. I, P. I, 26, t. 9. HOOK TAYL. 12, t. 8. Eng. bot. t. 2676. BRID. op. c. NEES HORNSCH. HUEBEN. DE NOT, &c.

Gymn. reflexum BRID. Bry. univ. i, 63.

Pottia minutula, rufescens and *conica* FUERNR op. c. 10.

Pottia minutula et Var. β. *rufescens* and γ. *conica* Bry. eur. WILS. Bry. br. 93. SCHIMP. Synops. BERK. DE NOT.

Pottia Starkei Var. γ. *gymnostoma* LINDB. de Tort. 219 (1864).

HAB.—Clay soil and fallow fields ; not uncommon.

Although the three plants here brought together, are usually regarded as distinct, there is no structural difference to be detected between them ; the capsule is very variable in length, and the peristome equally so in the amount of its development.

10. POTTIA ASPERULA *Mitten.*

Paroicous; densely cæspitose. Leaves quinquefarious, obovate-spathulate, obscure, papillose, nerve excurrent; caps. oval, lid conic, rostellate, cal. papillose. (T. XXIX, D.)

SYN.—*Pottia asperula* MITT. Journ. Bot. 1871, p. 4. BRAITHW. Journ. Bot. 1871, p. 290. HOBK. Syn. br. m. 56 (1873.)

Paroicous; densely cæspitose, short, pale yellowish-green. Leaves quinquefarious, obovate-spathulate, acute, not acuminate, nerve excurrent in a longish point, margin slightly recurved; upper cells quadrato-hexag. rather obscure, each with several minute conical papillæ, lower hexagono-rectang. smooth, pellucid. Seta rather short, reddish yellow, caps. oval or turbinate when empty, widest about the middle, reddish brown; cal. with scattered obtuse papillæ on the upper half; lid paler, conic with a short oblique obtuse beak.

HAB.—Banks and crevices of rocks near the sea; rare. Fr. 1—3.

Henfield, Sussex (*Mitten*) ! ! Jersey (*Piquet*). Howth, Dublin (*Moore* 1856). Penlee point, Penzance and Perran cliff (*Curnow* 1871) ! !

This much resembles *P. truncatula*, but has leaves more obscure and papillose, as is also the calyptra. *P. viridifolia* and *crinita* are distinguished by octofarious leaves and a smooth cal. though in other respects coming very near to it.

11. POTTIA VIRIDIFOLIA *Mitten.*

Paroicous; densely cæspitose. Leaves octofarious, obovate-spathulate, papillose, nerve excurrent; caps. oblong, lid rostellate, cal. smooth. (T. XXIX, E.)

SYN.—*Pottia pallida* (non LINDB.) BRAITHW. Journ. Bot. 1870, p. 255.

Pottia viridifolia MITT. Journ. Bot. 1871, p. 5. BRAITHW. Journ. Bot. 1871, p. 290. Pl. 119, f. 4. HOBK. Syn. br. m. 57 (1873).

Paroicous; densely cæspitose, bright yellow green. Leaves octofarious, forming a rosette-like coma, obovate-spathulate, erecto-patent, obtuse or slightly acute, margin recurved at the middle, nerve excurrent in a short point; upper cells hexagonal, obscure with chlorophyl, papillose, lower oblong, hyaline, smooth. Caps. on a short yellow seta, oblong, narrower than in *P. asperula*, rufous brown; cal. smooth, lid rostrate.

HAB.—Earthy ledges of rocks by the sea; not common. Fr. 1—3.

By an old quarry near St. John's, Plymouth (*Holmes* 1870) ! ! Slate rocks at Pentire and Withiel (*Tellam* 1871) ! ! Boscawen cliff and Tregyptian cliff, Penzance (*Curnow* 1872) ! ! Basaltic rocks at Blackhead, Belfast (*Stewart* 1884) ! !

The deep green colour and firm texture of this plant are remarkable, and the leaves are appressed and twisted when dry.

12. POTTIA WILSONI (*Hook.*) *Br. Schimp.*

Paroicous; in dense round tufts. Leaves octofarious, obovate-oblong, nerve excurrent in a long point; areolation minute opake. Caps. long, elliptic; cal. scabrous, lid rostrate. (T. XXIX, F.)

SYN.—*Bryum exiguum, creberrimis capsulis rufis.* DILL. Hist. musc. 347, t. 45, f. 7 A—E (1741) et Herb.

Gymnostomum Wilsoni HOOK. Bot. miscel. i, 143, t. 41 (1830), Br. Fl. 8 (1833). WILS. in Eng. bot. suppl. t. 2710 (1834).

Pottia Wilsoni BRUCH SCHIMP. Bry. eur. fasc. 18—20, Mon. 11, t. 6 (1843). C. MUELL, Synops. i, 554 (1849). WILS. Bry. brit. 95, t. 41 (1855). SCHIMP. Synops. 124 (1860). 2 ed. 152 (1876). BERK. Handb. br. m. 270 (1863). LINDB. de Tort. 220 (1864), MITT. Journ. Bot. 1871, p. 3. HUSN. Mouss. nord-ouest. 66 (1873). HOBK. Syn. br. m. 56 (1873). LESQ. JAMES Mosses N. Amer. 101 (1884).

Gymnost. Combæ? DE NOT. Syll. 286 (1838).

Entosthymenium mucronifolium BRUCH in Flora xii, P. II, 387, t. 1, f. 11 (1829), sec. Mitten e spec.

Paroicous; cæspitose, simple, pale glaucous green. Leaves octofarious, crowded, accrescent upward, erecto-patent, when dry subimbricated, lower obovate-oblong, upper broadly oblongo-spathulate with a rounded apex, cuspidate with the longly excurrent nerve, plano-convex with the margin recurved; cells lax and rectangular at base, above opake, small quadrate, chlorophyllose, strongly verruculose, the two marginal rows larger and more transparent. Cal. fuscescent and scabrous above; caps. with a distinct neck, oblongo-elliptic, narrower at mouth, glossy castaneous, on an orange seta, twisted to the right when dry; lid from a convex-conic base, obliquely rostrate, ann. rather broad, of 1 series of cells; a rudimentary peristome sometimes present as an irregular papillose membrane. Male inflor. free in the axils of the comal leaves.

HAB.—Sandy rocky ground; not common. Fr. 1—2.

Over, Cheshire (*Wilson* 1828)!! Barrow hill, Henfield (*Borrer*)! Llanfachlog and Holyhead (*Wilson* 1830)! Old wall at Haymarket, Edinburgh. Carnarvon (*Valentine* 1838). Penzance (*Curnow* 1861)!! Marazion bridge (*Curnow* 1869). West Kirby, Birkenhead (*Boswell* 1862)!! Cawsand Bay (*Hunt* 1871)!! Minehead (*Miss Gifford* 1867)! Southport (*Wild* 1876)! Blackburn (*Dr. Wood* 1877)! St. Minver and Marazion (*Tellam* 1879)! Wrexham (*Bowman*).

Best distinguished by its elongated capsule, and the minute opake areolation of the upper part of leaf; the ripe capsule becomes rugose when dry. The plant from Marazion bridge has longer hair-points, and a tapering apex, composed of narrow incrassate rhomboidal cells.

13. POTTIA CRINITA *Wilson.*

Paroicous; resembling *P. Wilsoni*. Leaves octofarious, spathulate, obtuse, the nerve excurrent in a long pale green hair; cal. smooth; caps. shorter with a wider mouth, lid obliquely rostellate. (T. XXX, A.)

SYN.—*Pottia crinita* WILS. MSS. BRUCH SCHIMP. Bry. eur. fasc. 42, t. 1 (1849). C. MUELL. Synops. ii, 622 (1851). WILS. Bry. brit. 95, t. 41 (1855). SCHIMP. Synops. 125 (1860),

2 ed. 153. BERK. Handb. br. m. 271, t. 23, fig. 2 a-d (1863). LINDB. de Tort. 220 (1864). DE NOT. Epil. bri. ital. 586 (1869). MITT. Journ. bot. 1871, p. 5. HOBK. Syn. br. m. 56 (1873).

Paroicous; densely cæspitulose, innovating at apex, bright yellow-green. Leaves dense, octofarious, spathulate, very obtuse, nerve excurrent in a long pale green rigid hair; margin recurved; cells at base thin, pellucid, narrowly rectangular, above papillose, chlorophyllose, larger, hexagonal. Seta orange, twisted to the left above, to the right below; caps. oval with a short neck, leptodermous, shorter and wider at mouth than that of *P. Wilsoni*, reddish brown; cal. large smooth, lid short, pale red, obliquely rostellate, ann. very narrow, persistent; spores smooth. Antheridia naked, in pairs in the axils of the comal leaves.

HAB.—Moist banks and rocks by the sea. Fr. 3—4.

Near Forfar (*Don* 1802). Redhead, Montrose (*Drummond* 1827)! Girdleness lighthouse, Aberdeen (*Dickie* 1840)!! Penzance and Guernsey (*Ralfs* 1844)!! Torquay (*Mrs. Griffiths*). Aldrington beach, Brighton (*Mitten*)!! Between Garth ferry and Beaumaris (*Frazer* 1867)! Elie, Fife (*Howie* 1867)! St Prideux head, Devon (*Holmes* 1870)! Old Cambus, Northumberland (*Hardy* 1869)! Shaugh, Devon; Trevarthen and St. Minver (*Tellam* 1879)!! Kymyal cliff, and Boscawen cliff, Penzance (*Curnow* 1872)!! Howth, Dublin; Rossbay and Malahide (*Moore*). Blackhead, Belfast (*Stewart* 1882)! Douglas and Kirkmichael, I. of Man (*Holt* 1880)!!

Closely resembling *P. Wilsoni* with which it was at first confounded by Hooker, but readily separated by the smooth calyptra and lax areolation, which is like that of *P. truncatula*.

14. **POTTIA LATIFOLIA** (*Schwaeg.*) *C. Muell.*

Autoicous; cæspitose. Leaves closely imbricated, broadly obovate, smooth, nerve vanishing below apex. Caps. oval-oblong, lid oblique, rostrate; teeth of per. lanceolate, cleft. (T. XXX, B.)

SYN.—*Weissia latifolia* SCHWAEG. in SCHULTES Reis. Grossglock. IV, App. (1804), Suppl. I, P. I, 64, t. 18 (1811). GREV. Scot. Cr. fl. iii, t. 149 (1814). ROEHL. Deutsch. fl. iii, 51 (1813). BRID. Mant. 44 (1819), Bry. univ. i, 356 (1826). FUNCK Moost. 13, t. 9 (1821). HOOK. TAYL. Musc. brit. 2 ed. 80, t. suppl. 3 (1827). HOOK. Br. fl. ii, 20 (1833).

Grimmia latifolia WEB. MOHR Bot. Tasch. 147 (1807).

Anacalypta latif. FUERNR. in Flora xii, P. II, Erganz. 25 (1829). NEES HORNSCH. Bry. germ. ii, P. II, 135, t. 36, f. 1 (1831). BRUCH SCHIMP. Bry. eur. fasc. 18—20, p. 5, t. 4 (1843). RABENH. Deutsch. kr. fl. ii, s. 3, 99 (1848). WILS. bry. brit. 100, t. 33 (1855). SCHIMP. Synops. 129 (1860). BERK. Handb. br. m. 269 (1863). DE NOT. Epil. bri. ital. 579 (1869). HOBK. Syn. br. m. 58 (1873).

Dermatodon latif. HUEBEN. Musc. germ. 116 (1833).

Desmatodon bulbosus DE NOT. Syllab. 203 (1838). AONGST. in Nov. act. soc. Upsal. xii, 369 (1844).

Didymodon bulbosus HARTM. Skand. fl. 4 ed. 382 (1843).

Pottia latifolia C. MUELL. Synops. i, 549 (1849). SCHIMP. Synops. 2 ed. 158 (1876). JURATZ. Laubm. oester.-ung. 94 (1882). LESQ. JAMES Mosses N. Amer. 103 (1884).

Pottia pilifera β. *mutica* LINDB. de Tort. 223 (1864).

Tortula bullata β. *mutica* LINDB. Musc. scand. 21 (1879).

Stegonia latifolia VENTURI in Rev. bryol. 1883, p. 96.

Autoicous; gregarious or cæspitulose, gemmiform, stramineous or silvery; stem simple or innovating. Leaves imbricated, glossy, broadly obovate, lower obtuse, upper apiculate, very concave, margin incurved, nerve vanishing below apex; cells at base rectangular, above small, rhombic, incrassate. Perich. bracts elongated, narrowed, seta longish, orange, caps. oval-oblong, annulate, glossy castaneous, lid obliquely rostrate; teeth lanceolate, entire or cleft to middle, pale or reddish. Male infl. gemmiform, bracts three, oval.

HAB.—Crevices of rocks; very rare. Fr. 5—6.

Glen Phee, Clova (*Drummond* 1824)!! Carr rocks above Castleton (*Dickie* 1867)!!

Differing so much in habit from the other species that I have felt tempted to follow Venturi and regard this as the type of a distinct genus, but the similarity in the capsule and peristome to those of *Pottia* has inclined me to retain it here. According to specimens in Dickson's and Smith's herbaria, *Bryum piliferum* DICKS. Crypt. fasc. IV, 10, t. 10, fig. 14. belongs to *Tortula* (*Desmatodon*) *systylia* (BR. SCHIMP.) a rare species found at great altitudes in Norway, and most unlikely ever to have been found at Aberfeldy; *P. latifolia var. β. pilifera* (*Dicranum bullatum* SOMM.) must therefore be excluded from our lists as well as *Tortula* (*Desmatodon*) *latifolia* (HEDW.).

5. TORTULA HEDW.

(Fund. musc. II, 92 (1782).)

Plants short or tall, cæspitose, simple or dichotomously branched, yellowish-green. Leaves oblong or spathulate, papillose, usually obtuse with the nerve excurrent or extended into a long pellucid hair; areolation hyaline and elongated at base, quadrato-hexag. opake and chlorophyllose above; perich. bracts scarcely diverse. Cal. cucullate. Caps. erect, oblong or cylindraceous, subincurved, sometimes gymnostomous, teeth of peristome 32, filiform, carinate, papillose, remotely jointed, placed on a distinct tubular, more or less elongated basal membrane, straight, incurved or spirally contorted. Spores small, nearly smooth. Inhabiting the ground, walls, or rocks, rarely trees. Der. *tortus* twisted.

The genera *Tortula* and *Barbula* were founded by Hedwig in his Fund. muscorum, but he gives no other distinction than that *Tortula* has monoicous infl. (ex. *T. muralis* and *subulata*), and *Barbula* dioicous (ex. *B. ruralis* and *unguiculata*). This character is, of course, insufficient to separate genera, and Schreber amended it by uniting the two, and naming it *Tortula*, in which he has been followed by most English authors, while the continental writers sink *Tortula* and use that of *Barbula*. By bringing into greater prominence the colour and structure of the leaves, we obtain two series, which may conveniently be retained as

genera under the old names, *Tortula* being used for the species with broad green leaves, and more or less opake areolation, *Barbula* for those with narrow leaves, becoming rust coloured or yellow, and the cells incrassated or dot-like. We are thus able to bring under *Barbula* mosses without peristomes to the fruit, but agreeing so closely in the vegetative system with species of *Barbula*, that in a barren state it is impossible to separate them—*e.g.*, *Gymnostomum curvirostre.*

The teeth of the peristome in *Tortula* consist of two rows of cells, which are not on the same plane; the inner series larger paler and transversely striate on a minute scale, the outer more solid and reddish.

CLAVIS TO THE SPECIES.

Teeth of peristome not united in a tube.
- Nerve narrow, lamelliferous above.
  - Capsule ovate, gymnostomous. — *pusilla.*
  - ——— subcylindric, peristome imperfect. — *lamellata.*
- Nerve very broad, covered above with short jointed filaments.
  - Synoicous. — *brevirostris.*
  - Dioicous.
    - Calyptra reaching half way down capsule. — *stellata.*
    - ——— only covering lid.
      - Capsule erect, straight. — *ericæfolia.*
      - ——— inclined, subincurved. — *aloides.*
- Nerve free from appendages.
  - Nerve much thicker toward apex. — *atrovirens.*
  - ——— thin and regular.
    - Leaves without a thickened border.
      - Leaves with plane margins, points not hoary.
        - Caps. oblong; l. broad, obovate mucronate. — *cuneifolia.*
        - ——— cylindric, l. subspathulate, long-pointed. — *Vahlii.*
      - Leaves with recurved margins and hoary hair-points. — *muralis.*
    - Leaves with a thickened border.
      - Plants short, simple, l. acute, pointed — *marginata.*
      - ——— tall, branched, l. obtuse, mucronate. — *mucronata.*

Lower ¼—⅔ of peristome forming a tesselated tube.
- Nerve gemmiferous above. — *papillosa.*
- Nerve smooth.
  - Stem short, leaves yellowish green.
    - Leaves piliferous, capsule oblong. — *canescens.*
    - Leaves cuspidate, caps. cylindraceous.
      - Leaves broad, subspathulate, entire. — *subulata.*
      - ——— narrow, linear oblong, bluntly serrate. — *angustata.*
  - Stem elongated, l. dingy green or rufescent.
    - Leaves obtuse, emarginate. — *mutica.*
    - ——— piliferous.
      - Hair point smooth. — *lævipila.*
      - ——— spinulose.
        - Leaves squarroso-recurved. — *ruralis.*
        - ——— erecto-patent.
          - Dioicous, olivaceous green. — *montana.*
          - Synoicous, ferruginous. — *princeps.*

Sect. 1. DESMATODON (*Brid.*). Stems short; leaves like those of Pottia, often hair-pointed. Peristome a short basal tubular membrane, bearing 32 teeth, filiform, free or united at base by transverse bands, slightly twisted or spirally contorted.

A. Pterygoneuron. Nerve on the upper surface bearing 2 or 4 vertical lamellæ.

1. TORTULA PUSILLA (*Hed.*) *Mitt.*

Autoicous. Leaves obovate, piliferous, concave, lamelligerous in the upper part. Caps. ovate, gymnostomous. (T. XXX, C.)

SYN.—*Bryum pusillum* HEDW. Fund. musc. II, 32 (1782). RELH. Fl. cant. 404 (1785). LAICH. Pl. eur. 484 (1794). WITH. Bot. arr. br. veg. 3 ed. iii, 811 (1796). ABBOT Fl. bedf. 240 (1798). HULL Br. fl. P. II, 256 (1799).

Gymnostomum pusillum HEDW. op. c. 87.

Gymn. ovatum HEDW. Stirp. cr. i, 16, t. 6 (1787), Sp. musc. 31. ROTH Tent. fl. germ. i, 453 (1788), iii, P. II, 123. TIMM Fl. meg. n. 724 (1788). SCHRANK Baiers. fl. ii, 438 (1789). SIBTH. Fl. oxon. 272 (1794). HOFFM. Deutsch. fl. ii, 27 (1795). BRID. Musc. rec. II, P. I, 40 (1798), Sp. musc. I, 31 (1806), Mant. 12 (1819), Bry. univ. i, 59 (1826). SWARTZ Musc. suec. 20 (1799). ROEHL. Moosg. deutsch. 15 (1800), Ann. wett. ges. i, 121, Deutsch. fl. iii, 38 (1813). TURN. Musc. hib. 9 (1804). SM. Fl. brit. 1160 (1804); Eng. bot. t. 1889. P. BEAUV. Prodr. 59 (1805). SCHULTZ Fl. starg. 279 (1806). WEB. MOHR Bot. Tasch. 80 (1807). SCHKUHR Deutsch. kr. gew. P. II, 20, t. 9 (1810). SCHWAEG. Suppl. I, P. I, 79 (1811). VOIT Musc. herb. 15 (1812). WAHLENB. Fl. carp. 334 (1814); Fl. ups. 390 (1820). MART. Fl. cr. erl. 420 (1817). HOOK. TAYL. Musc. br. 11, t. 7 (1818). HARTM. Skand. fl. 383 (1820). FUNCK Moost. 5, t. 4 (1821). HOOK. Fl. scot. P. 2, 122 (1821), Br. fl. ii, 8 (1833). GRAY Nat. arr. br. pl. i, 715 (1821). ZENK. DIETR. Musc. thur. II, n. 47 (1822). NEES HORNSCH. Bry. germ. i, 128, t. 9, f. 5 (1823). HUEBEN. Musc. germ. 36 (1833). MACK. Fl. hib. P. 2, 10 (1836). DE NOT. Syll. 284 (1838).

Pottia cavifolia EHRH. Beitr. i, 187 (1787). KUNZE Deutsch. cr. gew. 20 (1795). BR. SCH. Bry. eur. f. 18—20, p. 7, t. 2 (1843). C. MUELL. Synops. i, 550 (1849). RABENH. Deutsch. kr. fl. ii, s. 3, 96 (1848). WILS. Bry. br. 92, t. 7 (1855). SCHIMP. Syn. 122 (1860), 2 ed. 151. BERK. Handb. br. m. 269, t. 23, f. 2, e. (1863). DE NOT. Epil. 585 (1869). MILDE Bry. sil. 95 (1869). HUSN. Mouss. nord-ouest. 64 (1873). LESQ. JAMES Mosses N. Amer. 101 (1884).

Bryum ovatum DICKS. Crypt. II, 4 (1790).

Pottia ovata FUERNR. in Flora xii, P. II, Erganz. 10 (1829).

Pottia pusilla LINDB. in Oefv. vet. ak. foerh. xx, 410 (1863); de Tort. 218 (1864). HOBK. Syn. br. m. 55 (1873).

Tortula pusilla MITT. Journ. Linn. Soc. Bot. xii, 165 (1869).

Pterigoneurum cavifolium JURATZ. Laubm. oester.-ung. 96 (1882).

Autoicous; stems simple, short. Leaves obovate-oblong, very concave, subimbricated, erecto-patent, crowded into a gemmule; nerve excurrent as a hair of variable length, bearing on the upper side two follicles which burst and form 4 lamellæ, decurrent on the nerve; cells above quadrate, at base rectangular. Caps. on a short red seta, ovate or elliptic, brown, gymnostomous; annulus of two rows of cells, lid shorter than caps. obliquely rostellate. Male infl. gemmiform at base of fruiting shoot, bracts broadly ovate, nerved half-way.

HAB.—On banks and tops of walls. Fr. 1—3.

A very variable plant, in the length of the seta, and the hair-point to the leaf, and so closely allied to the next species that it must be placed with it, and therefore to be regarded as the connecting link between *Pottia* and *Tortula*. Another of this group—*T. subsessilis* (BRID.) is found in central Europe.

Var. β. **incana** (*Nees Hornsch.*)

Plants short in small crowded tufts; leaves with very long hair-points; capsule scarcely emergent, spheric-oval.

SYN.—*Gymn. ovatum* Var. *incanum* NEES HORNSCH. BRY. germ. 130, t. 9, f. 5. BRID Bry. univ. i, 61.

Pottia cavifolia Var. *incana* SCHIMP. Synops. 122.

HAB.—Newhaven (*Borrer* 1838)! Harbury, Warwick (*Bagnall*)!!

2. TORTULA LAMELLATA *Lindb.*

Autoicous; stem simple. Leaves broad, oval-oblong, mucronate with the excurrent nerve, very concave, nerve at upper part with 4 broad lamellæ. Caps. subcylindric, peristome very fragile, adherent to lid. (T. XXX, D.)

SYN.—*Gymnostomum ovatum* Var. *β. gracile* HOOK. TAYL. Musc. br. 12 (1818); Br. Flora ii, 8 (1833). GRAY Nat. arr. br. pl. i, 715 (1821).

Pottia cavifolia Var. *δ. barbuloides* DURIEU MSS. SCHIMP. Coroll. 24; Synops. 122 (1860).

Pottia cavifolia Var. *δ. gracilis* WILS. Bry. br. 93 (1855).

Tortula lamellata LINDB. de Tort. 233 (1864). HOBK. Syn. br. m. 64 (1873).

Barbula concava SCHIMP. in Flora 1864, p. 210. MILDE Bry. siles. 110 (1869).

Barb. cavifolia SCHIMP. Bry. eur. suppl. fasc. 3—4 (1866). Synops. 2 ed. 193 (1876). HUSN. Mouss. nord-ouest. 79 (1873).

Pterigoneurum lamellatum JURATZ. Laubm. oester.-ung. 97 (1882).

Autoicous; stems short, simple, laxly cæspitose. Leaves at base small, distant, ovate, shortly piliferous, at middle broadly oval-oblong, uppermost spathulate-ligulate, slightly acuminate, mucronate with the excurrent nerve, all very concave, wings flattened towards margin, papillose at back; nerve furnished on the upper third in front, with 4 decurrent lamellæ; cells of upper part and of lamellæ minute quadrate, chlorophyllose, at base lax, hexagono-rectangular. Perich. bracts narrower; caps. on a straight rufous pedicel, erect, oblongo-cylindraceous, castaneous, with many furrows when dry; ann. simple, lid with a long oblique beak, teeth on a broadish clathrate membrane, very slender and fragile, pale, slightly twisted, generally breaking away, and remaining adherent to the inside of lid, spores smooth. Male infl. basal, gemmiform.

HAB.—On the ground and on walls covered with earth. Fr. 1—2.

Near Pontefract (*Nowell* 1853)!! Coombe Down, Bath (*Mrs. Hopkins* 1860)! Kidlington and Osney, Oxford (*Boswell* 1864)!! Aldrington, Sussex (*Davies*). Dublin (*Moore*). Helmsley, Yorks. (*Wesley* 1878)!!

The peristome is best seen through the lid of the young caps., but can seldom be found at maturity, or can only be observed in small fragments under the pressure of a covering glass. It also differs from the last by the long seta, cylindric capsule and oblique beaked lid.

B. Aloideæ. Leaves obtuse, concave with involute margins, nerve very broad, covered on upper side with granulose filaments.

3. TORTULA BREVIROSTRIS *Hk. Grev.*

Synoicous; plants gregarious. Leaves lingulate, obtuse. Caps. elliptic, lid ⅓ its length, obliquely conical. (T. XXX, E.)

SYN.—*Tortula rigida* SWARTZ Disp. musc. suec. 40, excl. syn. (1799). SM. Fl. brit. 1250 in obs. (1804). TURN. Musc. hib. 44 in obs. (1804). BRID. Sp. musc. I, 245, p.p. (1806). HARTM. Skand. fl. 403 (1820). WAHLENB. Fl. suec. ii, 763, excl. syn. (1826).

Tort. brevirostris HK. GREV. in BREWST. Edin. Journ. i, 289, t. 12 (1824). HK. TAYL. Musc. br. 2 ed. 53, Suppl. t. 2 (1827). HOOK. in DRUM. Musc. amer. bor. n. 136 (1828). AONGST. in nov. act. soc. Upsal. xii, 374 (1844). HARTM. op. c. 5 ed. (1849). HOLMES in Grevillea ii, 169, t. 23 (1874). JURATZ. Laubm. oester.-ung. 125 (1882).

Tort. enervis HARTM. op. c. 2—4 ed. (haud HK. GREV.).

Barbula rigida HEDW. Sp. musc. 115, p.p. (1801). LILJEBL. Svensk. fl. 3 ed. 536 (1816). SCHULTZ in nova act. acad. cæs. Leop. xi, 196, p.p. (1823). BRID. Bry. univ. i, 528, p.p. (1826). Var. γ. *brevi rostris* BRID. op. c. i, suppl. 824 (1827).

Barbula brevirostris (haud FUERNR.) BR. SCHIMP. Bry. eur. fasc. 12—15, p. 16, t. 2 (1842). C. MUELL. Synops. i, 597 (1849). SCHIMP. Synops. 163 (1860), 2 ed, 189. LINDB. de Tort. 233 (1864). MILDE Bry. siles. 110 (1869). LESQ. JAMES Mosses N. Amer. 115 (1884).

Synoicous; very small, gemmiform, gregarious. Lower leaves roundish, very obtuse, upper lingulate, obtuse erect, very concave, all sheathing at base, margins hyaline, inflexed; nerve rather thin, covered above with a mass of short cellular threads. Seta reddish, half-inch high, caps. erect, elliptico-cylindric, rufo-fuscous; ann. broad, of 3 rows of cells, separating spirally, lid one-third length of caps. conic, rostellate; peristome rufous-purple, once contorted.

HAB.—Walls in limestone districts; v. rare. Fr. 8—10.

Old wall at Parson's Green, Edinburgh (*D. Stuart*, 1824). Wall top in Ashwood Dale Buxton (*George*, 1873).

The little group of aloid *Tortulæ* are very closely allied, and transverse sections of their leaves will be found useful in their discrimination. There is considerable difficulty in fixing on the species intended by some of the early authors, and the name *rigida* has been applied to all four, but, thanks to Lindberg's research, we are able to get rid of it altogether, and adopt prior names.

T. brevirostris may be immediately recognized by its short lid and synoicous inflorescence, and to Mr. Holmes's acuteness we owe the verification of the original specimens with the species intended by the founders.

4. TORTULA STELLATA (*Schreb.*) *Lindb.*

Dioicous; leaves oblong, obtuse or shortly pointed. Caps. elliptic-oblong, straight; cal. covering half caps., peristome rather long in several spirals. (T. XXX, F.)

SYN.—*Bryum stellatum* SCHREB. Spic. fl. lips. 80 (1771). HOFFM. Deutsch. fl. ii, 45, ex. cl. syn. (1795).

Barbula rigida SCHULTZ Nov. act. ac. caes. leop. xi, I, 196, p.p. t. 32, f. 1 (1823). HEDW. Stirp. cr. i, 65 p.p. t. 25, f. 16 (1787); Sp. musc. 115 p.p. (1801). BRID. Musc. rec. II, P. I, 192 excl. syn. t. 3, f. 19 (1798), Mant. 88 (1819), Bry. univ. i, 528 (1826). WEB. MOHR Bot. Tasch. 212 (1807). FUERNR. BRUCH in Flora xii, P. 2, 599 (1829). HUEBEN. Musc. germ. 309 excl. syn. (1833). BRUCH SCHIMP. Bry. eur. fasc. 13—15, p. 13, t. 1

(1842). RABENH. Deutsch. kr. fl. ii, S. 3, 103 (1848). C. MUELL Synops. i, 596 (1849). SCHIMP. Syn. 163 (1860), 2 ed. 189. MILDE Bry. siles. 111 (1869). LESQ. JAMES Mosses n. amer. 116 (1884).

Tortula rigida SCHRAD. Spic. fl. germ. 66 (1794). BRID. Sp. musc. I, 245 excl. syn. (1806). SWARTZ Musc. suec. 40 (1799). ROTH Fl. germ. iii, P. I, 211 (1800). AONGST. in Nov. act. soc. Upsal. xii, 373 (1844). SPRUCE in Ann. mag. n. h. 2 ser. iii, 374 (1849). WILS. Bry. br. 120, t. 32 (1855). DE NOT. Musc. ital. I, 17, t. 3 (1862); Epil. bri. ital. 529 (1869). BERK. Handb. Br. m. 259 (1863). JURATZ. Laubm. oester.-ung. 125 (1882).

Tort. enervis HK. GREV. in BREWST. Ed. journ. i, 288 (1824). HK. TAYL. Musc. br. 2 ed. 52 excl. syn. Suppl. t. 2 (1827). HARTM. Skand. fl. 5—8 edd.

Tort. brevirostris HK. GREV. op. c. 289 p.p. HK. TAYL. op. c. 53 (nec diagn.). GREV. Scott. cr. fl. vi, t. 331 (1829).

Desmatodon rigidus MITT. Journ. Lin. soc. i, suppl. 38 (1859).

Tortula stellata LINDB. de Tort. 233 (1864). HOBK. Syn. br. m. 63 (1873).

Dioicous; short, simple, gregarious or laxly cæspitulose. Leaves from an erect sheathing base, patulous, lower small ovate-oblong, ferruginous, upper twice as long, deep green, oblong, muticous or apiculate, margin inflexed; nerve broad, covered on surface with 2—5 jointed threads. Cal. straw-coloured, long-beaked, reaching to middle of caps. Seta reddish brown, caps. erect, ovato-elliptic or subcylindric, reddish-brown; lid long beaked, crenulate at base, ann. broad, revoluble; teeth of per. longer, purplish, twice convolute; spores smooth. Male plants very minute, bracts three, broad, ovate, obsoletely nerved.

HAB.—Mud capped walls in calcareous districts. Fr. 9—3.

Near York (*Spruce*). Newtimber, Sussex (*Mitten*)! Near Ilkley (*Baker*, 1859)! Oxford (*Boswell*, 1860)!! Mottram, Cheshire (*Whitehead*, 1860)! Blackburn and Burnley (*Hunt*, 1867)! Camborne, Cornwall (*Curnow*). Craiglockhart and Crookston Edinburgh. Cork and Dublin (*Moore*). Pontefract and Knottingley (*Dr. Wood*). Gloucester (*Stark*). Peak forest (*Whitehead*, 1871)! Crambeck, Malton, Hovingham, and Scalby (*Spruce*, 1843). Yate, Bristol (*Thwaites*). Bowness.

This species is readily recognised by the elliptic capsule, and the calyptra reaching halfway down. In dry seasons the upper leaves sometimes run out into a short hyaline point, which even extends into a long hair—the var. *piligera* DE NOT.

5. TORTULA ERICÆFOLIA (*Neck.*) *Lindb.*

Dioicous; short. Leaves patulous, ligulato-lanceolate, obtuse, incurved at tip. Caps. erect, cylindric; annulus simple, subpersistent, cal. covering the lid only; per. short, once twisted. (T. XXX, G.)

SYN.—*Bryum acaulon, Ericæ tenuifoliæ* Ger. *folio* DILL. Hist musc. 388, t. 49, f. 55 (1741) et Herbar.

Bryum ericæfolium NECKER in Act. ac. Theod.-pal. ii, 451 (1770); Meth. musc. 193 (1771).

Barbula rigida HEDW. St. crypt. i, 65 p.p. t. 25 excl. fig. 16 (1787).

Barbula brevirostris FUERNR, et BRUCH in Flora xij, P. II, 599 (1829). HUEBEN. Musc. germ. 308, excl. syn. (1833).

Tortula aloïdes DE NOT. in Mem. ac. Torin. XL, 306 p.p. et Syllab. 177, p.p. (1838).

Barbula ambigua BR. SCHIMP. Bry. eur. f. 13—15, Mon. 14, t. 2 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 104 (1848). SCHIMP. Synops. 164 (1860), 2 ed. 190. C. MUELL, Synops. i, 596 (1849). MILDE Bry. siles. 111 (1869). LESQ. JAMES Mosses n. amer. 116 (1884).

Tortula ambigua AONGST. in nov. act. soc. Upsal. xii, 376 (1844). SPRUCE in HOOK. Journ. Bot. iv, 191 (1845), et Ann. mag. n. h. 2 ser. iii, 374 (1849). HARTM. Skand. fl. 5—8 edd. WILS. Bry. br. 120, t. 42 (1855). DE NOT. Musc. ital. I, 16, t. 2 (1862); Epil. bri. ital. 529 (1869). BERK. Handb. br. m. 259 (1863). LINDB. de Tortul. 234 (1864). HOBK. Syn. br. m. 64 (1873). JURATZ. Laubm. oester.-ung. 126 (1882).

Dioicous; short, laxly cæspitose. Leaves longer, horizontal, expanded, from an ovate base, lineal-lanc., incurved at tip, arcuate when dry, reddish at back. Seta red below, pale above. Cal. short, reaching just to lid; caps. erect, cylindraceous, brown, sulcate when dry, ann. narrow, persistent, lid elongato-conic, entire at margin; teeth of per. longer, red, once twisted, when dry arcuato-incurved; spores smooth.

HAB.—Walls and marly banks. Fr. 11—3.

Welburn, Malton, and near York (*Spruce*, 1847). Warrington, Clitheroe, and Newton Viaduct (*Wilson*, 1848)!! Pontefract and Knottingley (*Nowell*). Bristol (*Thwaites*). Blackburn and Burnley (*Hunt*)!! Dublin and Cork (*Moore*, 1874)!! Sussex (*Mitten*). Witney and Oxford (*Boswell*)!! Bowness (*Barnes*)! Beaumaris (*Wilson*, 1856)!! Plymouth (*Holmes*)! Wadebridge and Newlyn cliff, Cornwall (*Curnow*). Bearley, Warwick (*Bagnall*). Reigate (*Holmes*, 1873)!! Wetherby, Yorks. (*Wesley*)!!

Often growing with *T. aloides*, but easily known by the cucullate tips of the leaves, the erect cylindric capsule and the bright red incurved teeth.

6. TORTULA ALOIDES (*Koch*) *De Not.*

Dioicous; short. Leaves long, linear-lanceolate, acuminate, acute. Caps. cylindraceous, inclined, subarcuate; cal. reaching a little below the lid, per. scarce twisted, arcuato-incurved when dry. (T. XXXI, A.)

SYN.—*Bryum rigidum* SM. Eng. Bot. t. 180 (1794).

Tortula rigida SM. Fl. brit. 1249 (1804). HOOK. TAYL. Musc. br. 30 p.p. t. 12 (1818). HOOK. GREV. in BREWST. Edin. Journ. i, 289 p.p. (1824). WILS. in Eng. Bot. Suppl. t. 2759 (1834). HARTM. Sk. fl. 4—8 edd.

Trichostomum aloides KOCH MSS. SCHULTZ Recens. Barb. 197 (1823). BRID. Bry. univ. i, Suppl. 816 (1827). WALLR. Fl. crypt. germ. i, 172.

Barbula aloides FUERNR. BRUCH in Flora XII, P. II, 598 (1829). HUEBEN. Musc. germ. 307 (1833). BR. SCHIMP. Bry. eur. f. 13—15, p. 15, t. 2 (1842). C. MUELL. Synops. i, 596 (1849). RABENH. Deutsch. kr. fl. ii, S. 3, 104 (1848). SCHIMP. Synops. 165 (1860); 2 ed. 191. MILDE Bry. siles. 111 (1869). HUSN. Mouss. nord-ouest. 78 (1873).

Tortula aloides DE NOT. Syllab. musc. 177 (1838); Musc. ital. I, 15, t. 1 (1862); Epil. bri. ital. 528 (1869). BERK. Hand. br. m. 259 (1863). LINDB. de Tort. 235 (1864). HOBK. Syr. br. m. 64 (1873). JURATZ. Laubm. oester.-ung. 126 (1882).

Dioicous; short, dull green. Leaves erecto-patent, longer, rigid, linear-lanceolate, acuminate, acute, nerve incrassate in the middle, convex at back, often reddish. Caps. from curving of the seta, cernuous or subhorizontal, cylindraceous, subarcuate, rufo-fuscous on upper side, pale fuscous beneath; cal. reaching a little beyond lid, ann. of small cells, long persistent, lid rostrate, acute; teeth of per. very slender, pale red, simply contorted, when dry arcuato-incurved with the points assurgent; spores larger, smooth.

HAB.—Clay banks and wall tops. Fr. 11—2.

Dublin, Mayo, Sligo and Galway (*Moore*). Ripley, Yorks. (*Baker* 1856)! Islip and Shotover, Oxford (*Boswell* 1858)!! Beaumaris and Bangor (*Wilson* 1863)!! Black-

burn and Marple (*Hunt* 1863)! Levens (*Barnes* 1867)! Sussex Downs (*Davies*)!! Crambeck and Welburn, Yorks. (*Spruce* 1843)! Newton Viaduct (*Wilson*, 1847)!! Masham (*Mudd*). Thirsk and Byland Abbey (*Baker*). Hovingham, Ingleboro and Settle, Yorks. (*Hobkirk*). Greenheugh, Burnmouth and Wooler (*Hardy*). Bearley, Red Hill and Maxtoke, Warwick (*Bagnall*). Ashwood Dale, Derby. (*Holt* 1880)!! Common in Devon and Cornwall.

C. Desmatodon. Nerve free from appendages; leaves soft, highly chlorophyllose.

7. TORTULA ATROVIRENS (*Sm.*) *Lindb.*

Autoicous; dwarf, cæspitulose. Leaves spreading, oblong, subspathulate, concave, apiculate, with reflexed margins; nerve thickened anteriorly above the middle, slightly excurrent. Caps. oval, lid obliquely rostellate, teeth of per. unequal, short, obliquate, not contorted. (T. XXXI, B.)

SYN.—*Trichostomum convolutum* BRID. Sp. musc. I, 232 (1806), Mant. 83 (1819), Bry. univ. i, 492 (1826). C. MUELL. Synops. i, 590 (1849). SCHIMP. Synops. 153 (1860). BERK. Handb. br. m. 261, t. 22, f. 8 (1863). HUSN. Mouss. nord.-ouest. 75 (1873).

Grimmia atrovirens SM. Eng. Bot. t. 2015 (1809).

Didymodon nervosus HOOK. TAYL. Musc. brit. 66, t. 20 (1818). BRID. Bry. univ. i, 516. GRAY Nat. arr. br. pl. i, 742 (1821). HOOK. Br. fl. ii, 28 (1833). MACK. Fl. hibern. P, 2, 17 (1836).

Trichostomum nervosum FUERNR. in Flora xii, P. II, Erganz. 32 (1829). HUEBEN. Musc. germ. 295 (1833).

Desmatodon nervosus BR. SCHIMP. Bry. eur. f. 18—20, Mon. 6, t. 3 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 100 (1848). SPRUCE in Ann. mag. n. h. 2 ser. iii, 374 (1849). SCHIMP. Coroll. 26 (1855). WILS. Bry. brit. 103, t. 20 (1855). DE NOT. Epil. bri. ital. 576 (1869). LESQ. JAMES Mosses N. Amer. 113 (1884).

Tortula atrovirens LINDB. de Tort. 236 (1864). HOBK. Syn. br. m. 65 (1873).

Barbula nervosa MILDE Bry. siles. 112 (1869).

Barbula atrovirens SCHIMP. Synops, 2 ed. 194 (1876).

Desmatodon atrovirens JURATZ. Laubm. oester.-ung. 136 (1882).

Autoicous; dwarf, cæspitulose or subpulvinate, dingy green. Leaves densely imbricated, spirally convolute when dry, erecto-patent when moist, oval-oblong, concave, nerve yellowish, thickened above anteriorly, excurrent in a short acute mucro, margin entire, revolute, cells at base lax shortly rectangular with two marginal rows quadrate, above minute quadrate, opake very finely papillose. Caps. on a short reddish seta, erect, oval, fuscous, exannulate; lid half length of caps., conic obliquely rostellate; teeth of per. on a pale exserted basal membrane, irregular, unequal, papillose, rufo-ferruginous, erect and straight when dry, slightly twisted obliquely when wet; spores smooth. Male infl. minute gemmaceous, at base of female, bracts ovato-lanc., faintly nerved.

HAB.—Dry banks and old walls, especially near the sea. Fr. 3—5.

Killiney Bog, Dublin (*Taylor*). Cork (*Carroll*). Bray Head, Wicklow and Youghal (*Sargint*). Hastings (*Fenner*)!! Dawlish (*Holmes*). Seaton Cliffs, Cornwall (*Brent*). Truro (*Tellam*). Drayton Bushes, Warwick (*Bagnall*). Old Cambus and Eyemouth, Northumberland (*Hardy*). Anglesea (*Wilson*). Barmouth (*Holt* 1882)!!

The tufts of this little moss are generally filled with fine sand or mud, so that the lower part becomes brown and dead; the peristome when moist shows a decided tendency to become twisted, though straight when dry.

8. TORTULA CUNEIFOLIA (*Dicks.*) *Roth.*

Autoicous; densely gregarious, pellucid green. Leaves rosulate above, obovate-spathulate, smooth; nerve thin vanishing or excurrent; cells lax, quadrate. Caps. erect, oblong, lid conic, oblique; peristome closely contorted. (T. XXXI, C.)

SYN.—*Bryum humile, pilis carens viride et pellucidum.* DILL. Hist. musc. 356, t. 45, f. 15 (1741), et Herbar.

Bryum murale Var. β. HUDS. Fl. angl. 406 (1762).

Bryum cuneifolium DICKS. Pl. crypt. III, 7 (1793). HOFFM. Deutsch. fl. ii, 45 e synon. (1795). HULL Br. fl. P. II, 256 (1799).

Tortula cuneifolia ROTH Tent. fl. germ. iii, P. I, 213 (1800). SM. Fl. brit. iii, 1257 (1804); Eng. Bot. t. 1510. TURN. Musc. hib. 51 p.p. (1804). HOOK. TAYL. Musc. br. 31, t. 12 (1818). GRAY Nat. arr. br. pl. i, 723 (1821). HOOK. GREV. in BREWST. Ed. Journ. i, 297 (1824). MONT. in Arch. Bot. i, 137 (1832). HOOK. Br. fl. ii, 46 (1833). MACK. Fl. hibern. P. 2, 26 (1836). DE NOT. in Mem. ac. Torin. xl, 296 (1838), Syllab. 174 (1838), Musc. ital. I, 28, t. 10 (1862), Epil. bri. ital. 534 (1869). SPRUCE in Ann. mag. n. h. 2 ser. iii, 375 (1849). WILS. Bry. Brit. 128, t. 12 (1855). BERK. Handb. br. m. 254 (1863). LINDB. de Tort. 237 (1864). HOBK. Syn. br. m. 65 (1873).

Tortula spathulæfolia DE NOT. op. c. 297, et Syllab. 174.

Barbula Dicksoniana SCHULTZ Recens. Barb. et Syntr, 224, t. 34, f. 33 (1823). HUEBEN. Musc. germ. 311 (1833).

Barbula cuneifolia BRID. Bry. univ. i, 549 excl. syn. (1826). BR. SCHIMP. Bry. eur. f. 13—15, Mon. 31, t. 17 (1842). C. MUELL. Synops. i, 628 (1849). BERTOL. Fl. ital. crypt. 209. SCHIMP. Synops. 182 (1860), 2 ed. 198. HUSN. Mouss. nord-ouest. 84 (1873). LESQ. JAMES Mosses N. Amer. 117 (1884).

Desmatodon cuneifolius JURATZ. Laubm. oester.-ung. 133 (1882).

Autoicous; laxly cæspitose or gregarious, bright green. Lower leaves remote broadly ovate, shortly acuminate, upper crowded in a patulous rosette, obovate-spathulate, smooth, soft, thin, often complicate-concave; nerve thin, vanishing below apex or excurrent in a mucro or longer point, margin erect, more or less flexuose, cells at base elongated, very lax and pellucid, above roundish-quadrate, soft and diaphanous, with granular chlorophyl. Caps. on a long purple straight seta, erect oblong or subcylindric, regular or very slightly incurved, olive brown, ann. simple, persistent, lid ⅓ length of caps., conic; per. on a broadish basal membrane, reddish, much contorted. Male infl. near the female, gemmaceous, bracts broadly ovate, obtuse.

HAB.—Banks near the sea, and edge of ditches. Fr. 3—4.

Devon and Cornwall, frequent. Scotland (*Dickson*). Yarmouth (*Turner*). Tunbridge wells (*Forster*). Hastings (*Jenner*, 1841)! Shere (*Dr. Capron*, 1869)!! Grosty Hill, Halesowen (*Bagnall*, 1872)! Garth Ferry, Anglesea (*Wilson*)!! Bantry (*Miss Hutchins*). Cork (*Wilson*). Howth (*Orr*). Littlehampton and Maresfield (*Mitten*). Torquay and Torpoint (*Hooker*). Plymouth (*Holmes*)!! Budleigh Salterton (*Dickie*).

This moss belongs more especially to the Mediterranean area of distribution, and hence with us it occurs most frequently in the south of

Ireland, and on the coast of Devon, Cornwall and Dorset. It is remarkable for the soft texture of the leaves, which when old, lose their chlorophyl and become entirely diaphanous. Dickson's specimens were adulterated with *T. muralis* Var. γ. and thus led to some confusion in early continental writers.

9. TORTULA VAHLII (*Schultz*) *Wils.*

Autoicous; short, resembling *T. muralis*. Leaves oblong-cuneate, diaphanous, not revolute at margin, nerve excurrent in a green arista. Caps. cylindraceous, lid conico-rostellate, per. with a broad basal membrane. (T. XXXI, D.)

SYN.—*Barbula Vahliana* SCHULTZ Recens. Barb. et Syntr. 222, t. 34, f. 31 (1823). BRID. Bry. univ. i, 545 (1826). BR. SCHIMP. Bry. eur. f. 13—15, Mon. 33, t. 18 (1842). C. MUELL. Synops. i, 626 (1849). SCHIMP. Synops. 183 (1860), 2 ed. 199 (1876). LESQ. JAMES Mosses N. Amer. 117 (1884).

Tortula muralis α. HOOK. GREV. in BREWST. Edin. Journ. i, 292 p.p. (1824). ARNOTT in Mem. soc. d'hist. nat. Paris. ii, 285 p.p. (1825).

Tortula extenuata DE NOT. in Mem. ac. Torin. xl, 299 (1838), et Syllab. 174.

Tortula Vahliana WILS. Bry. Brit. 129 (1855). DE NOT. Musc. ital. I, 27, t. 9 (1862); Epil. bri. ital. 534 (1869). LINDB. de Tort. 237 (1864). HOBK. Syn. br. m. 65 (1873).

Autoicous; short, pale green, gregarious or cæspitulose. Leaves densely crowded, erecto-patent and flaccid when moist, appressed or twisting when dry, papillose at back, lower small, ovate, mucronate, upper oblong-lingulate, channelled, subundulate, apex obtuse or somewhat pointed, shortly piliformi-aristate with the excurrent nerve, margin more or less revolute; cells at base hexagono-rectangular, hyaline, upper small, obtusely angular, a single row at margin larger, rounded, yellowish, with projecting papillæ. Caps. on a pale purple seta, narrowly elongato-cylindric, slightly incurved, brown; lid elongato-conical, one-third length of caps. pale red; annulus broad, compound; per. contorted, orange, on a very short obscurely tessellated basal membrane.

Male infl. on a short lateral branch, bracts ovate, concave, obtuse or hair pointed.

HAB.—Damp clay soil by roadsides and ditches; rare. Fr. 4—5.

Angmering, Sussex (*Davies* 1863)!! Between Mayford heath and Pirbright common, Woking (*Sheppard* and *Westell* 1871)!! Cherryhinton, Cambridge (*H. N. Dixon* 1882)!!

Var β. **subflaccida** *Lindb.*

Plants smaller, dull green; leaves more opaque, shorter, flaccid, with plane margins, the nerve only excurrent in a short mucro; capsule and lid shorter.

SYN.—*Tortula muralis* β. DRUMMOND Mss.

T. oblongifolia WILS. Bry. brit. 129, t. 43. BERK. Handb. br. m. 254.

Barbula oblongifolia SCHIMP. Coroll. 141 et Synops. 185.

Tortula Vahlii Var. β. *subflaccida* LINDB. op. c. 238

HAB.—Moist banks.

Near Dublin (*Drummond* 1829)! Bray and Glasnevin, Dublin (*Moore* 1860)!! Near Blanchardstown (*Orr* 1867)!

This and the next three species are closely allied in habit and form of leaf, but may each be easily recognized with a little care. *T. Vahlii* comes nearest to *T. muralis*, but is distinguished by its cylindraceous capsules, and absence of the strongly recurved margins to the leaves.

The typical form, and also *T. cuneifolia*, vary considerably in the form of the leaf as well as in the extent of the nerve-point, and in this country it appears to prefer calcareous soil.

10. TORTULA MARGINATA (*Br. Sch.*) *Spruce.*

Dioicous; short. Leaves linear-oblongate, cuspidate with the excurrent nerve, the margin with a thickened border of narrow cells. Caps. oblong, erect, lid conic acuminate, peristome closely contorted. (T. XXXI, E.)

SYN.—*Bryum tegulare humile, pilosum et incanum*, Var. *non pilosa* DILL. Hist. Musc. 356, t. 45, fig. 14, F, G. (1741) et Herbar.

Tortula cæspitosa HOOK. GREV. in BREWST. Ed. Jour. i, 296 (1824). DE NOT. in Mem. ac. Torin. xl, 298 (1838), et Syllab. 174 (1838).

Barbula cæspitosa BRUCH MSS. (non SCHWAEGR.)

Barbula marginata BR. SCH. Bry. eur. fasc. 13—15, Mon. 33, t. 19 (1842). C. MUELL. Synops. i, 629 (1849). SCHIMP. Synops. 183 (1860), 2 ed. 199. MILDE Bry. siles. 114 (1869). HUSN. Mouss. nord-ouest 85 (1873). LESQ. JAMES Mosses N. Amer. 118 (1884).

Tortula marginata SPRUCE in HOOK. Lond. J. iv, 192 (1845), et in Ann. mag. n. h. 2 ser. iii, 375 (1849). WILS. Bry. brit. 131, t. 43 (1855). DE NOT. Musc. ital. I, 24, t. 7 (1862), Epil. bri. ital. 532 (1869). BERK. Handb. br. m. 253 (1863). LINDB. de Tort. 238 (1864). HOBK. Syn. br. m. 65 (1873).

Desmatodon marginatus MITT. Journ. Linn. soc. i, Suppl. 38 (1859). JURATZ. Laubm. oesterr.-ung. 132 (1882).

Tortula acuminata MITT. Journ. Linn. soc. Bot. xii, 167 (1869).

Dioicous; very short, densely gregarious. Leaves soft, pale green, erecto-patent, somewhat twisted when dry, sublingulate-oblong and narrowly subspathulate, apex obtuse or slightly acuminate, shortly piliformi-cuspidate with the yellow excurrent nerve; concave, carinate towards apex, margin erect with a narrow border of a double layer of 2—3 series of narrowly rectang. pachydermous yellowish cells, upper cells minutely papillose, hexagono-quadrate, opake and indistinct, basal smooth, hexagono-rectangular. Caps. on a longish purple seta, leptodermous, ovate-oblong or subcylindric, brown; lid pale red, conic elongated, oblique, half length of caps., annulus simple rather broad; per. on a short pale basal membrane, light red.

Male plants very small, simple; infl. gemmaceous, bracts ovato-lanceolate.

HAB.—Sandstone walls and by roadsides; not common. Fr. 4—5.

Norfolk (*Eagle*). Castle Howard and Coneysthorpe (*Spruce* 1843)! Hurstpierpoint (*Mitten* 1847)! Vale bridge, Sussex (*Davies* 1855)! Hincksey and Great Tew, Oxon (*Boswell* 1861). Budleigh Salterton (*Dickie*). Ashley mill and Green lane, Bowdon (*Hunt* 1870)!! Kirkham Abbey (*Hunt* 1871)!! Shere, Surrey (*Capron* 1879)!! Tunbridge Wells (*Jenner* 1846)! Shanklin (*Salwey* 1857)! Appleton lane (*Wilson* 1854)!! Pope's walk, Bath, ♂ (*Mrs. Hopkins* 1861)! Sutton park, Warwick (*Bagnall*)!! Towton, Yorks. (*West* 1881)!!

Resembling *T. muralis* but more slender, the leaves with a scarcely revolute margin, thickened border and shorter points; they vary in length and width. All the specimens I have examined have been certainly dioicous.

11. TORTULA CANESCENS *Mont.*

Autoicous; short, hoary when dry. Leaves oblongo-lanceolate, piliferous, scarcely revolute at margin. Caps. erect, elliptic; lid conic; peristome tubular at base for nearly half its length. (T. XXXI, F.)

Syn.—*Tortula canescens* Montagne in Arch. Bot. i, 133, t. 4, fig. 3 (1832), et Sylloge crypt. 40 (1856). De Not. in Mem. ac. Torin. xl, 300 (1838), Syllab. 175 (1838), Musc. ital. I, 30, t. 11 (1862), et Epil. bri. ital. 535 (1869). Spruce in Ann. mag. n. h. 2 ser. iii, 375 (1849). Wils. Bry. brit. 130, t. 43 (1855). Berk. Handb. br. m. 253 (1863). Lindb. de Tort. 238 (1864). Hobk. Syn. br. m. 66 (1873).

Barbula canescens Bruch MSS. Br. Schimp. Bry. eur. fasc. 13—15, Mon. 34, t. 19 (1842). Rabenh. Deutsch. kr. fl. ii, s. 3, 110 (1848). C. Muell. Synops. i, 625 (1849). Schimp. Synops. 184 (1860), 2 ed. 201. Bertol. Fl. ital. cr. 210 (1858). Milde Bry. siles. 113 (1869). Husn. Mouss. nord.-ouest. 85 (1873).

Desmatodon canescens Juratz. Laubm. oesterr.-ung. 133 (1882).

Autoicous; short, gregariously cæspitose, bright green when moist, hoary when dry. Leaves patulous, oblong and oblong-ligulate, concave, obtuse at apex, very minutely papillose above, margin very slightly revolute, nerve excurrent in a long hair; cells at base pellucid, elongato-rectangular, the rest quadrato-hexagonal. Caps. on a shortish red seta, leptodermous, erect, elongato-elliptic, reddish brown, lid conic, elongated, half length of caps., annulus rather broad, breaking up; per. with the basal membrane forming a pale red tessellated tube for nearly half its length, teeth red, contorted.

Male infl. gemmiform, on a slender branch, bracts ovate-oblong.

Hab.— Channel coast, very rare. Fr. 5.

On loose sandy earth, on face of chalk cliffs near the Lover's Seat, Hastings (*Jenner* 1844)!!

Quite a Mediterranean species and resembling *T. muralis*, but with broader leaves of laxer texture, slightly acuminate at points and the margins much less recurved; it is readily distinguished from it by the tube of the peristome.

12. TORTULA MURALIS (*L.*) *Hedw.*

Autoicous; compactly tufted, bright green and hoary. Leaves spathulate-oblong, obtuse, the margin strongly revolute, nerve excurrent in a hyaline hair. Caps. oblongo-cylindric, lid conic rostellate; peristome with a very narrow basal membrane. (T. XXXI, G.)

SYN.—*Muscus capillaceus minor, capitulis erectis vulgatissimus* RAY Synops. 2 ed. 28, n. l. (1696).

Muscus trichoides parvus, capitula creberrima oblonga erecta habitiora, per siccitatem atrorubentia producens Vernon. RAY op. c. 33, n. 30.

Bryum minus, erectis minus falcatis capitulis, foliis latiusculis congestis in pilum canescentem desinentibus DILL. in RAY. Syn. 3 ed. 94 (1724).

Bryum tegulare humile pilosum et incanum DILL. Hist. musc. 355, t. 45, f. 14 A—E (1741), et Herbar.

Bryum murale L. Sp. pl. ii, 1117 (1753). Fl. suec. 2 ed. 993 (1755). HUDS. Fl. angl. 406 (1762). WEISS Crypt. Goett. 192 (1770). Neck. Meth. musc. 197 (1771), Del. Gallo-belg. ii, 458. WITHER. Bot. arr. br. veg. ii, 673 (1776). LIGHTF. Fl. scot. ii, 720 (1777). WEBER Spic. fl. goett. 100 (1778). RELHAN Fl, cant. 403 (1785). HOFFM. Deutsch. fl. ii, 45 (1795). ABBOT Fl. bedf. 240 (1798). HULL Brit. fl. II, 256 (1799).

Mnium murale SWARTZ Meth. musc. 27 (1781).

Tortula muralis HEDW. Fund. II, 92 (1782), Sp. musc. 123. SIBTH. Fl. oxon. 284 (1794). BRID. Musc. rec. II, P. I, 186, t. 3, f. 20 (1798), Sp. musc. I, 250 (1806). SWARTZ Musc. suec. 39 (1799). ROTH Fl. germ. iii, P. I, 203 (1800). ROEHL. Moosg. deutsch. 400 (1800). SMITH Fl. brit. 1256 (1804); Eng. Bot. t. 2033. TURN. Musc. hib. 50 (1804). P. BEAUV. Prodr. 92 (1805). SCHULTZ Fl. starg. 304 (1806). WAHLENB. Fl. carp. 238 (1814), Fl. upsal. 375 (1820). HOOK. TAYL. musc. brit. 30, t. 12 (1818). HOOK. Fl. scot. P. 2, 127 (1821), Br. fl. ii, 44 (1833). GRAY Nat. arr. br. pl. i, 722 (1821). MACK. Fl. hib. P. 2, 25 (1836). DE NOT. in Mem. acc. Torin. xl, 301 (1838), Syllab. 175 (1838), Musc. ital. I, 31, t. 12 (1862), Epil. bri. ital. 536 (1869). WILS. Bry. br. 130, t. 12 (1855). BERK. Handb. br. m. 253, t. 22, f. 3 (1863). LINDB. de Tort. 239 (1864). HOBK. Syn. br. m. 66 (1873).

Barbula muralis TIMM Fl. megap. 240 (1788). WEB. MOHR Bot. Tasch. 206 (1807). SCHWAEG. Suppl. I, P. I, 132 (1811). VOIT Musc. herb. 55 (1812). ROEHL. Deutsch. fl. iii, 78 (1813). MART. Fl. cr. erl. 90 (1817). ZENK. DIETR. Musc. thuring. I, n. 13 (1821). SCHULTZ Recens. 221, t. 34, f. 29 (1823). BRID. Bry. univ. i, 546 (1826). HUEBEN. Musc. germ. 313 (1833). BR. SCH. Bry. eur. fasc. 13—15, Mon. 35, t. 20 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 109 (1848), C. MUELL. Synops. i, 625 (1849). SCHIMP. Synops. 185 (1860), 2 ed. 201. MILDE Bry. siles. 113 (1869). LESQ. JAMES Mosses N. Amer. 119 (1884).

Mollia muralis SCHRANK Bayer. Fl. ii, 456 (1789).

Desmatodon muralis JURATZ. Laubm. oesterr.-ung. 134 (1882).

Autoicous; densely pulvinate or cæspitant, yellowish or glaucous green and canescent, sparingly branched. Leaves when dry appressed and twisting, when moist patent, lower oblongo-lanceolate, upper elongate-ligulate, with the apex obtuse, unequally prolonged or subcordate, minutely papillose, the margin yellowish, strongly revolute; nerve yellow, excurrent in a diaphanous hair; upper cells small, chlorophyllose, indistinct, basal rectangular, hyaline. Caps. on a purple or yellow seta, oblongo-subcylindric, pachydermous, regular, dark brown, annulus narrow, subpersistent; calyptra large, pale brown, lid obliquely conico-rostellate; peristome purple, closely convolute, on a very narrow basal membrane.

Male infl. gemmaceous, on a short lateral branch, bracts ovate, obtuse, mucronate with the nerve.

HAB.—On walls, stones and rubbish; very common. Fr. 4—5.

Var. *β.* **rupestris** (*Schultz*).

Plants robust, taller, more branched; leaves broader, oblong; caps. cylindraceous, on a long seta.

SYN.—*Barbula muralis* β. *rupestris* SCHULTZ Recens. 221, t. 34, f. 29 B. BRID. Bry. univ. i, 548. SCHIMP. l. c.

Tortula muralis δ. *rupestris* WILS. l. c.

HAB.—Wet, shady rocks and rotten trees, most frequent in limestone districts.

Var. γ. **æstiva** (*Brid.*).

Plants short in large flat tufts; leaves longer, narrower, lineal, nerve ending in a mucro or very short hair; caps. shorter on a shorter seta.

SYN.—*Mollia tegularis* SCHRANK Baiers. fl. ii, 457.

Tortula muralis β. *æstiva* BRID. Musc. rec. II, P. I, 137. HOOK. TAYL. Musc. br. 30.

Tortula æstiva P. BEAUV. Prodr. 91.

Barbula cuneifolia WEB. MOHR Bot. Tasch. 207. TURN. Musc. hib. p.p.

Barbula æstiva SCHULTZ Recens. 223, t. 34, f. 32. BRID. Bry. univ. i, 548.

HAB.—On sandstone and calcareous rocks; rare.

Henfield, Sussex (*Borrer*)! Ashley Mill, Cheshire (*Dr. Wood*).

One of our commonest mosses and also a most variable one in size of leaf, seta and capsule; the obtuse leaves with strongly recurved margins and smooth white hair points are the most distinctive characters of the species. The hair points are longest when the plants grow in dry exposed localities, but this condition is hardly sufficient to constitute a distinct variety.

13. TORTULA MUCRONATA (*Brid.*) *Lindb.*

Dioicous; tall, branched, deep green. Leaves elongato-lingulate, papillose on both sides, mucronate with the stout nerve, suddenly incrassate at margin. Caps. cylindraceous, lid with an oblique beak; teeth on a narrow basal membrane, clathrate at base. (T. XXXII, A.)

SYN.—*Barbula mucronata* BRID. Sp. musc. I, 268 (1806).

Rhacomitrum flavipes BRID. Mant. 81 (1819), Bry. univ. i, 224 (1826).

Desmatodon dichotomus BRID. Bry. univ. i, 823.

Trichostomum flavipes STEUD. Nomencl. 421 (1824). DE NOT. Syll. 183 (1838).

B. Brebissoni BRID. Bry. univ. i, 834 (1827). SCHIMP. Bry. eur. Suppl. fasc. 3—4 (1866). Synops. 2 ed. 222 (1876). MILDE Bry. siles. 122 (1869). HUSN. Mouss. nord-ouest. 80 (1873).

Didymodon Cinclidotus DE NOT. in Mem. acad. Torin. xl, 325 (1838).

Tortula Brebissoni FIOR.-MAZZ. Bry. rom. 2 ed. 9 (1841). DE NOT. Epil. bri. ital. 547 (1869).

Cinclidotus riparius Var. β. *terrestris* BR. SCHIMP. Bry. eur. fasc. 16, p. 11, t. 2 (1842). WILS. Bry. brit. 138, t. 44 (1855). SCHIMP. Synops. 195 (1860). BERK. Handb. br. m. 248 (1863).

Tortula cylindrica WILS. in Phytol. 1845, p. 282.

Cinclidotus flavipes DE NOT. MSS. 1861.

Guembelia riparia Var. β. *terrestris* C. MUELL. Synops. ii, 651 (1851).

Barbula romana C. MUELL. in Bot. zeit. 1856, p. 419.

Tortula mucronata LINDB. de Tort. 239 (1864). HOBK. Syn. br. m. 66 (1873).

Desmatodon Brebissoni JURATZ. Laubm. oesterr.-ung. 136 (1882).

Dioicous; laxly tufted, 1—2 in. high, bright green above, dull green below, dirty fuscous at base, fastigiate branched, with red radicles and persistent nerves of decayed leaves at lower part. Leaves crowded and erecto-patent above, twisted when dry, elongato-lingulate, mucronate with the stout semi-terete nerve, concave, margin lightly recurved, suddenly incrassate, except at the hyaline base, densely and minutely papillose above; cells at base lax, hexagono-rectang. hyaline, median oblongo-hexag. chlorophyllose, apical minute, subpunctiform, rounded hexag. Perich. bracts with a thinner nerve, narrower, not recurved, the margin scarcely incrassate; caps. on a stout yellow seta, leptodermous, erect, elongated, cylindraceous, slightly incurved, pale fuscous, calyptra large brownish, lid orange, conical with a blunt oblique beak, falling with the columella, annulus none; teeth on a narrow basal membrane, clathrato-conjoined at base, once twisted, orange red, fugacious.

Male plants intermixed with female, infl. terminal, gemmaceous, outer bracts ovato-lanc., inner broadly ovato-acuminate.

HAB.—At roots of old trees by rivers, not common. Fr. 5.

Near the Mole at Beeching wood, Mickleham (*Borrer*)!! Llanffinnan, Anglesey (*Wilson* 1828)! Stapleton, Bristol (*Thwaites* 1843)!! Hurstpierpoint (*Mitten*)! Great Bardfield, Essex (*Borrer* 1844)! Tyffry, Anglesey (*Hunt* 1858)! Eggleston bridge, Teesdale (*Spruce* 1845)! Willenhall cemetery (*Kirk* 1863)! Brighton (*Davies* 1868)!! Plymouth (*Holmes* 1868)!! Banks of the Alne, Wootton (*Bagnall* 1873)!! Sherborne, and by the Monnow and Wye, Monmouth (*Boswell* 1877)!! Menmuir and Caterthun, Forfar (*Anderson*). Kinnordy (*Fergusson*). Houghton, Northampton (*Dixon*)!! Glanvilles Wootton, Dorset (*Rev. H. Wood* 1880)!!

Although long united to *Cinclidotus riparius*, that moss differs from the present by its cladocarpous fruit, its lurid blackish colour, the leaves straight and appressed when dry, with plane margins and more slender nerve lost in the apex, the basal cells quadrate, incrassate, the upper rounded, 4—6 angled and quite smooth.

Neat specimens of this moss are difficult to meet with, as its close vicinity to streams renders it liable to receive deposits of mud, and the soft laminæ of the leaves are easily abraded.

Sect. 2. ZYGOTRICHIA (*Brid.*). Stems short; leaves spathulate, green, pointed with the excurrent nerve. Peristome combined at lower part into a long tube, spirally tessellated.

14. **TORTULA SUBULATA** (*L.*) *Hedw.*

Autoicous; leaves spathulate-oblong, rosaceous, entire, with a yellowish border, nerve excurrent in a mucro. Caps. very long, cylindric, slightly curved, the tube of per. obliquely tessellated. (T. XXXII., B.)

SYN.—*Muscus trichoides minor, capitulis longissimis* Dodoy. RAY. Syn. Stirp. br. 243 (1690).
Muscus capillaris corniculis longissimis incurvis RAY Syn. 2 ed. 29 (1696).

Bryum erectis longis et acutis falcatis capitulis, calyptra subfusca, foliis serpylli pellucidis DILL. Cat. Giss. 223 (1719), et in RAY. Syn. 3 ed. 92 (1724).

Bryum capsulis longis subulatis DILL. Hist. musc. 350. t. 45, fig. 10 (1741), et Herbar.

Bryum subulatum L. Sp. pl. ii, 1116 (1753), Syst. Nat. ii, 701. HUDS. Fl. angl. 405 (1762). WEISS Crypt. goett. 187 (1770). NECK. Meth. musc. 194 (1771). WITH. Bot. arr. br. veg. ii, 672 (1776). LIGHTF. Fl. scot. ii, 719 (1777). WEB. Fl. goett. 99 (1778). CURT. Fl. Lond. fasc. 3, t. 66 (1778). RELH. Fl. cant. 402 (1785). HOFFM. Deutsch. fl. ii, 46 (1795). ABBOT. Fl. bedf. 242 (1798). HULL Br. fl. P. 2, 263 (1799). Fl. Dan. t. 1000, f. 2.

Mnium subulatum SW. Meth. musc. 28 (1781).

Tortula subulata HEDW. Fund. ii, 92 (1782), Sp. musc. 122, t. 37 (1801). ROTH Fl. germ. i, 461 (1788). TIMM Fl. meg. 220 (1788). SIBTH. Fl. oxon. 284 (1794). BRID. Musc. rec. II, P. I, 184 (1798). SWARTZ Musc. suec. 39 (1799). ROEHL. Moosg. deutsch. 384 (1800), Deutsch. fl. iii, 77 (1813). SM. Fl. brit. iii, 1255 (1804), Eng. Bot. t. 1101. TURN. Musc. hib. 44 (1804). SCHWAEG. Suppl. I, P. I, 135, t. 34 (1811). WAHLENB. Fl. lapp. 316 (1812), Fl. carp. 337 (1814). HOOK. TAYL. musc. br. 31, t. 12 (1818). GRAY Nat. arr. br. pl. i, 723 (1821). HOOK. Fl. scot. P. 2, 127 (1821), Br. fl. ii, 45 (1833). MACK. Fl. hib. P. 2, 26 (1836). DE NOT. in Mem. acc. Torin. xl, 293, et Syllab. 173 (1838), Musc. ital. I, 46, t. 21 (1862), Epil. bri. ital. 545 (1869). WILS. Bry. brit. 132, t. 12 (1855). BERK. Handb. br. m. 252 (1863). LINDB. de Tort. 242 (1864). HOBK. Syn. br. m. 72 (1873).

Mollia subulata SCHRANK Bayers. Fl. ii, 455 (1789), Fl. Salisb. n. 830 (1792).

Barbula subulata P. BEAUV. Prodr. 43 (1805) et in Mem. Soc. Linn. Par. i, t. 6, f. 2 (1822). BRID. Sp. musc. I, 267 (1806). SCHULTZ Fl. starg. 305 (1806). BR. SCH. Bry. eur. fasc. 13—15, Mon. 36, t. 21 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 110 (1848). C. MUELL. Synops. i, 623 (1849). SCHIMP. Synops. 186 (1860), 2 ed. 223. MILDE Bry. siles. 125 (1869). HUSN. Mouss. nord-ouest. 86 (1873). LESQ. JAMES Mosses N. Amer. 130 (1884).

Syntrichia subulata WEB. MOHR. Bot. Tasch. 214 (1807). VOIT Musc. herb. 53 (1812). MART. Fl. cr. erl. 87 (1817). BRID. Mant. 97 (1819), Bry. univ. i, 579 (1826). SCHULTZ Recens. 226, t. 34, f. 1 A (1823). HUEBEN. Musc. germ. 335 (1833).

Desmatodon subulatus JURATZ. Laubm. oesterr.-ung. 138 (1882).

Autoicous; laxly cæspitose, robust, bright green, short, simple or branched. Leaves rosaceous, erecto-patulous, obovato- and spathulate-oblong, mucronate with the excurrent nerve, entire or obscurely serrate at apex, subundulate, with the margin plane and a yellow border of narrow pachydermous cells, more or less distinct or wanting; cells at base lax, rectangular, hyaline, above opake, chlorophyllose, finely papillose. Calyptra large, brownish, caps. on a stout reddish seta twisted to the left, elongated, cylindraceous, subarcuate, brown, pachydermous, lid narrowly conic, annulus of a double series of cells; tube of per. very long, pale red, obliquely quadrately tessellated, teeth red.

Male infl. gemmiform, on a short lateral branch, bracts ovato-lanc., the nerve vanishing.

HAB.—Sandy banks by roadsides and hedges; common. Fr. 5—6.

Var. *β.* **subinermis** (*Br. Sch.*).

Dull green; leaves dense, oblong and ovato-lanceolate, mucronate, indistinctly bordered; caps. shorter on a shorter pedicel.

SYN.—*Barbula subulata* Var. *subinermis* BR. SCHIMP. Bry. eur. Mon. 37.
Tortula subulata Var. *β. subinermis* WILS. Bry. brit. 132.

HAB.—Shady places and on stumps of trees.

Thelwall, Warrington (*Wilson* 1843)! Largo, Fife (*Howie* 1873)!! New Forest (*Lyell*). Dailly, Ayrshire (*Schimper*).

T. subulata is easily recognized by its broad pale green leaves and long capsules, but varies considerably in the marginal cells of the leaves. *T. mucronifolia* SCHWAEG. has not been recorded as British, but appears to be only a variety of *subulata* with a shorter capsule and smooth leaves. *T. inermis* MONT. is a closely allied species, with oblong obtuse muticous leaves, strongly revolute at the margin, and more minutely areolate; it should be sought for in the S.W. of England, as it is found in France and Portugal.

15. TORTULA ANGUSTATA *Wils.*

Autoicous; resembling *T. subulata*, but more slender. Leaves lanceolate, acute, with a narrow thickened border, obtusely serrate above. Caps. cylindric, narrow, subarcuate. (T. XXXII, C.)

SYN.—*Tortula angustata* WILS. MSS. LINDB. de Tort. 243 (1864), et Musc. Scand. 20 (1879).
Barbula subulata Var. δ. *angustata* SCHIMP. Syn. 2 ed. 224 (1876).
Desmatodon subulatus Var. β. *augustatus* JURATZ. Laubm. oesterr.-ung. 138.

Autoicous; resembling *T. subulata*, but more slender. Leaves narrowly ovato-lanceolate, tapering into a very acute point, erecto-patent when moist, erect and less twisted when dry, subserrated toward apex, margin incrassate, of very long narrow hyaline smooth cells. Calyptra more glossy; seta longer and more slender, twisted to the right below, to the left above; caps. paler, suberect, long, narrowly cylindric, per. paler, tubular for three-fourths its length, lid longer and more acute.

HAB.—Moorland banks, rare. Fr. 3—4.

Castle mill, Ringway, Cheshire (*Wilson* 1833)! Clifton Scope, York (*Spruce* 1843)!!

Although generally regarded as a variety of *subulata*, this moss has all the appearance of a distinct species, and this view the characters and figures here given will we think sufficiently confirm.

Sect. 3. SYNTRICHIA (*Brid.*). Stems tall, branched; leaves large, oblong, obtuse, the nerve usually piliformi-aristate. Peristome tubular below, striato-tessellate.

16. TORTULA MUTICA *Lindb.*

Dioicous; cæspitose, dark dull green. Leaves spathulate-ovate, obtuse, emarginate, nerved to apex. Caps. cylindraceous, annulus simple, peristome tubular in lower third part. (T. XXXII, D.)

SYN.—*Syntrichia lævipila* Var. β. *mutica* SCHULTZ Recens. Barb. et Syntr. 230, t. 34, f. 4 B (1823). BRID. Bry. univ. i, 836 (1827).
Syntrichia latifolia BRUCH Flora vii, P. 2, p. 761 (1824). HUEBEN. Musc. germ. 342 (1833). AHNF. in FRIES Fl. scand. 240 (1835). JURATZ. Laubm. oest.-ung. 142 (1882).

Tortula ruralis Var. β. *latifolia* ARN. in Mem. Soc. d'Hist. nat. Paris ii, 286 (1825).

Syntrichia ruralis Var. γ. *latifolia* SPRENG. in L. Syst. veg. 16 ed. iv, P. I, 177 (1827).

Tortula latifolia HARTM. Skand. fl. 2 ed. 322 (1832). SPRUCE in Ann. mag. nat. hist. 2 ser. iii, 376 (1849). WILS. Bry. br. 133, t. 43 (1855). BERK. Handb. br. m. 251 (1863). LINDB. de Tort. 243 (1864). HOBK. Syn. br. m. 72 (1873).

Barbula latifolia Br. SCHIMP. Bry. eur. fasc. 13—15, p. 41, t. 24 (1842). RABENH. Deutsch kr. fl. ii, s. 3, 111 (1848). C. MUELL. Synops. i, 632 (1849). JENS. Bry. dan. 110, t. 6, f. 30 a—c (1856). SCHIMP. Synops. 190 (1860), 2 ed. 227. MILDE Bry. siles. 128 (1869). HUSN. Mousss. nord-ouest 2 ed. 77 (1882). LESQ. JAMES Mosses N. Amer. 130 (1884).

Tortula mutica LINDB. Musc. Scand. 20 (1879).

Dioicous; irregularly cæspitose, sparingly branched. Dark dirty green. Lower leaves remote, obovate-oblong, upper crowded in a patulous rosette, larger, soft, erecto-patent, spathulate-lingulate, obtuse, emarginate at apex, when dry complicate and twisted; margin slightly recurved in lower half; nerve stout, vanishing at apex, or slightly excurrent, rough at back of apex; cells at base very lax, hexagono-rectangular, pellucid, above minute, obscure, roundish-hexagonal, very finely papillose. Inner perich. bracts more complicate and oblong. Caps. on a short stout reddish seta, castaneous, erect, oblongo-cylindric, slightly curved; annulus narrow of 3 rows of cells, lid paler, ⅓ length of caps. subobliquely subulate; per. pale red, tubular in lower third. Male infl. unknown.

HAB.—Tree trunks and rotten wood at edge of streams, liable to be overflowed; not common. Fr. 5.

Henfield, Sussex (*Borrer* 1844). Hurstpierpoint c. fr. (*Mitten*)! Suffolk (*Eagle* 1851). Near York c. fr. (*Spruce* 1843)! Glasgow (*Drummond*). Bristol (*Thwaites*)! Warrington (*Wilson*)! Buckingham c. fr. (*Holmes* 1874)!! Glasnevin (*Moore*). Lagan, Drumcro, Co. Down (*Rev. C. H. Waddell*)!! Ascott under Wychwood (*Boswell*). Codbeck, Sowerby c. fr. (*Baker*, 1855)! By the Adur, Shermanbury (*Borrer* 1844)! Jedburgh (*Jerdon*). Bowdon (*Hunt* 1865)!! By the Cherwell, Islip (*Boswell* 1859)!! Kingsthorpe, Northampton c. fr. (*Dixon* 1884)!! Oswestry (*Cash* 1882)! Drum Bridge, Antrim (*Stewart* 1878)!! Shere (*Capron*)!!

Readily known by its lurid green colour, and broad epilose leaves, narrowing towards the base. Mr. Waddell's specimen has minute globular gonidia scattered over the upper surface of the leaf, not unlike those of *T. papillosa*. The specific name *latifolia* is preoccupied by the union of *Desmatodon* with this genus.

17. TORTULA PAPILLOSA *Wils.*

Dioicous; short, tufted, dull green. Leaves obovate, concave, shortly hair-pointed; nerve gemmiparous on the upper half. Caps. short, erect, cylindric. (T. XXXII, E.)

SYN.—*Tortula ruralis* var. HOOK. TAYL. Musc. brit. 2 ed. 56 (1827).

Tortula papillosa WILS. MSS. SPRUCE in HOOK. Lond. J. iv, 193 (1845), et Ann. mag. n. h. 2 ser. iii, 376 (1849). WILS. Bry. brit. 135, t. 44 (1855). MITT. in HOOK. J. viii, 259 (1856), in Fl. Tasm. ii, 176 (1858), et Journ. Lin. soc. xii, 174 (1869). LINDB. in HARTM. Sk. fl. 8 ed. 391 (1861), de Tort. 244 (1864). BERK. Handb. br. m. 250 (1863). DE NOT. Epil. bri. ital. 543 (1869). HOBK. Syn. br. m. 71 (1873).

Tortula rotundifolia HARTM. Skand. fl. 5 ed. 381 (1849). C. MUELL. Synops. ii, 632 (1851).

Barbula papillosa C. MUELL. Synops. i, 598 (1849). MILDE Bry. siles. 127 (1869). HUSN. Mouss. nord.-ouest. 80 (1873). SCHIMP. Synops. 2 ed. 231 (1876). LESQ. JAMES Mosses N. Amer. 133 (1884).

Barbula rotundifolia JENS. Bry. dan. 110, t. 6, f. 30 f. g. (1856).

Syntrichia papillosa JURATZ. Laubm. oester.-ung. 141 (1882).

Dioicous; short, tufted, dull olive green or brown, slightly branched, fastigiate. Leaves erecto-patent, soft, lower obovate, upper obovate-spathulate, panduriform, very concave and subcochleariform, very slightly acuminate at apex, or rounded or obcordate; margin strongly involute; nerve thick and spongy, rufescent, excurrent in a mucro, or short smooth hair, with long papillæ at the back; and in front at the upper end in the younger leaves bearing chlorophyllose subglobose 2-4-celled gonidia, the wings papillose at back; cells above, rounded hexagons, at base lax, quadrate or hexagono-rectangular, hyaline. Caps. erect short, on a short seta, cylindraceous, rufescent, lid conico-subulate, oblique; per. pale, half length of caps. its lower third tubular.

HAB.—Trunks of tree, not uncommon but always sterile.

Rumsey churchyard, Hants. (*Lyell* 1818). Marl, Conway (*Wilson* 1844) ! ! Near York (*Spruce*) ! Hurstpierpoint (*Mitten*). Castle Howard (*Spruce* 1844) ! Newtimber (*Davies* 1857) ! ! Dailly, Ayr (*Shaw* 1861) ! Isle of Man (*Holt* 1881) ! ! Levens (*Barnes* 1868) ! Witney (*Westell*). Silverdale, Lanc. (*Nowell*) ! Stone walls at Perth. Killin (*Hunt* 1866) ! Noran, Forfar (*Anderson* 1868) ! Dublin, Powerscourt and Belfast (*Moore*). Watford (*Holmes*) ! !

The fruit of this moss has only been found at Sealer's Cove, Australia, by Baron Mueller, and Canterbury, New Zealand, by Sinclair and Haast. The gemmæ are very easily detached, and must be looked for on the uppermost leaves.

18. TORTULA LAEVIPILA (*Brid.*) *Schwaegr.*

Autoicous; in lax deep green tufts. Leaves spathulate-oblong, obtuse, nerve reddish, excurrent in a white smooth reflexed hair. Caps. subcylindric, curved; per. contorted, tubular in lower third. (T. XXXII, F.)

SYN.—*Syntrichia lævipila* BRID. Mant. musc. 98 (1819), Bry. univ. i, 586 (1826). SCHULTZ Rec. Barb. et Syntr. 230, t. 34, f. 4 (1823). WALLR. Fl. cr. germ. i, 193 (1831). HUEBEN. Musc. germ. 340 (1833). AHNF. in FRIES Fl. scand. 240 (1835). JURATZ. Laubm. oesterr.-ung. 140 (1882).

Tortula lævipila SCHWAEG. Supp. II, P. I, 66, t. 120 (1823). SPRUCE Ann. mag. n. h. 2 ser. iii, 376 (1849). HARTM. Skand. fl. 5—8 edd. p.p. WILS. Bry. Brit. 133, t. 43 (1855). BERK. Handb. br. m. 252 (1863). LINDB. de Tort. 245 (1864). HOBK. Syn. br. m. 71 (1873).

Tortula ruralis β. lævipila HOOK. GREV. in Ed. J. sc. i, 293 (1824). HARTM. Skand. Fl. 3—4 edd. ARN. in mem. soc. d'hist. nat. ii, 286 (1825). HOOK. Br. fl. ii, 45 (1833).

Barbula lævipila BR. SCHIMP. Bry. eur. fasc. 13—15, p. 40, t. 25 (1842). RABENH. Deutsch. kr. fl. ii, s. 3, 111 (1848). C. MUELL. Synops. i, 638 (1849). JENS. Bry. dan. 109 (1856). SCHIMP. Synops. 189 (1860), 2 ed. 226. MILDE Bry. siles. 127 (1869). HUSN. Mouss. nord-ouest 86 (1873). LESQ. JAMES Mosses N. Amer. 132 (1884).

Autoicous; in wide lax deep green tufts 1 in. high, subpulvinate, with dense rufous tomentum, dichotomously branched. Leaves patent, more or less recurved above, oblong or obovate-spathulate, the apex rounded and emarginate, not bordered, or with a yellowish border of rounded-hexag. pachydermous cells; nerve rufous, excurrent in a smooth or slightly denticulate, reflexed hyaline arista; basal cells lax, hexagonal, pellucid, upper minute, opake, finely papillose, margin plane above, slightly recurved below; perich. bracts more acuminate. Caps. on a stout purple seta, oblong or cylindraceous, slightly curved, pachydermous, deep brown, ann. double, lid paler, elongate conic, per. pale red, contorted, tubular in the lower third.

Male infl. axillar, sessile on a short branch, gemmiform, bracts ovato-acuminate.

HAB.—Trunks of trees and rails, not uncommon; sometimes on rocks. Fr. 5—6.

In appearance intermediate between the *T. ruralis* and *T. muralis* var. *β.*, from the former it is known by the smooth arista, brighter green colour and larger areolation, from the latter by the tubular peristome.

T. lævipiliformis DE NOT. is a variety with the leaf distinctly bordered; *Barbula pagorum* MILDE, a smaller obtuse leaved form, bearing numerous oblong, pointed gemmæ in the axils of the leaves.

19. **TORTULA MONTANA** (*Nees*) *Lindb.*

Dioicous; densely pulvinate, dull green. Leaves erecto-patent, oblongo-spathulate, plane, obtuse, with a rough arista, densely areolate. Caps. subcylindric, tube of per. short. (T. XXXIII, A.)

SYN.—*Syntrichia montana* NEES Flora ii, P. I, 301 (1819).

Syntrichia intermedia BRID. Bry. univ. i, 586 (1826). JURATZ. Laubm. oester.-ung. 144 (1882).

Tortula ruralis δ. crinita DE NOT. in Mem. ac. Torin. xl, 291 (1838), Syllab. 171 (1838), Musc. ital. I, 36, t. 15 (1862).

Barbula ruralis β. rupestris BR. SCHIMP. Bry. eur. fasc. 13—15, p. 43 (1842). C. MUELL. Synops. i, 640 (1849). SCHIMP. Synops. 192 (1860). HUSN. Mouss. nord-ouest 87 (1873).

Tortula ruralis β. minor WILS. Bry. brit. 134 (1855); et Var. *rupestris* WILS. in Suppl.

Tortula intermedia BERK. Handb. br. m. 251 (1863). LINDB. de Tort. 246 (1864). DE NOT. Epil. bri. ital. 540 (1869). HOBK. Syn. br. m. 71 (1873).

Barbula intermedia MILDE Bry. siles. 129 (1869). SCHIMP. Synops. 2 ed. 229 (1876).

Tortula montana LINDB. Musc. scand. 20 (1879).

Dioicous; densely cæspitose, dull green and canescent above, fuscous below; stems short, dichotomous, fastigiate. Leaves crowded, erecto-patent, a little recurved at apex, appressed and scarce curved when dry, oblongo-spathulate, rounded or emarginate at apex, concave

or nearly plane, margin lightly recurved up to middle, very minutely crenulate, with a broad yellowish border and no plaits; upper cells very obscure, verruculose, only half the size of those of *T. ruralis*, basal rectangular, diaphanous; nerve stronger, rufous, prolonged into a hair less rough than that of *T. ruralis*. Caps. shorter on a shorter seta; peristome and its tube shorter, less distinctly tessellated, paler, with only a single spiral. Male plant more slender, inner bracts roundish-ovate, concave, nerve vanishing.

HAB.—Sunny limestone rocks and walls; not uncommon. Fr. 4—5.

Near Conway, Aber and Malham (*Wilson*)!! Stenton rocks, Dunkeld (*Dr. B. White* 1865)! Bridge of Lochay (*Hunt* 1866)!! Thornton Gill, Ingleton and Bolton bridge (*Hunt* 1867)!! Witney, Oxon (*Boswell* 1878)!! Levens and Syergh Fell (*Barnes* 1868)! Millersdale, Bakewell and Chapel-en-le-Frith (*Holt* 1882)!! Angmering (*Davies* 1863)!! Dunsinko, Dublin (*Orr* 1857)!! Castle Taylor, Galway (*Moore*). Port Greenock, I. of Man (*Holt* 1881)!!

Readily distinguished from *T. ruralis* by the direction of the leaves and smaller areolation, as well as by the short and dense tufts.

20. TORTULA RURALIS (*L.*) *Ehrh.*

Dioicous; tall, loosely matted. Leaves from an erect base, squarroso-recurved, carinate, oblong, obtuse, with a long spinulose arista. Caps. cylindraceous, peristome very long, with a long tube. (T. XXXIII, B.)

SYN.—*Muscus capillaris tectorum, densis cespitibus nascens, capitulis oblongis, foliis in pilum longum desinentibus* RAY Synops. st. br. 2 ed. 28 (1696), Hist. pl. iii, 34 (1704).

Bryum erectis falcatis capitulis, trichodes, foliis latiusculis extantibus, in pilum canescentem desinentibus DILL. Cat. Giss. 224, t. 2 A—E (1719), in RAY Syn. 3 ed. 94 (1724).

Bryum caule erecto, foliis reflexis seta terminatis, capitulis falcatis L. Fl. lapp. 315 (1737).

Bryum rurale unguiculatum hirsutum elatius et ramosius DILL. Hist. musc. 352, t. 45, f. 12 A—C (1741), et Herb.

Bryum rurale L. Sp. pl. 1116 (1753), Syst. nat. ii, 701. HUDS. Fl. angl. 405 (1762). NECK. Meth. musc. 225 (1771). WITH. Bot. arr. br. veg. ii, 672 (1776). LIGHTF. Fl. scot. ii, 720 (1777). RELH. Fl. cant. 403 (1785). HOFFM. Deutsch. fl. ii, 45 (1795). ABBOT Fl. bedf. 790 (1798). HULL Br. fl. II, 265 (1799).

Hypnum rurale WEISS Cr. goett. 210 (1770). WEBER Fl. goett. 73 (1778).

Mnium rurale SWARTZ Meth. 27 (1781).

Barbula ruralis HEDW. Fund. II, 92 (1782), Sp. musc. 121 (1801). ROTH. Fl. germ. i, 461 (1788). TIMM Fl. meg. n. 793 (1788). BRID. Musc. rec. II, P. I, 195 (1798), Sp. musc. I, 258 (1806). ROEHL. Moosg. deutsch. 410 (1800). P. BEAUV. Prodr. 43 (1805). SCHULTZ Fl. Starg. 304 (1806). WAHLENB. Fl. lapp. 318 (1812). BR. SCH. Bry. eur. fasc. 13—15, p. 42, t. 27 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 112 (1848). C. MUELL. Synops. i, 639 (1849). SCHIMP. Synops. 191 (1860), 2 ed. 229. MILDE Bry. siles. 128 (1869). HUSN. Mouss. nord-ouest 86 (1873). LESQ. JAMES Mosses N. Amer. 132 (1884).

Mollia ruralis SCHRANK Bayers. fl. ii, 456 (1789). Fl. Salisb. n. 831 (1792).

Tortula ruralis EHRH. Beitr. vii, 100 (1792). SWARTZ Musc. suec. 39 (1799). SMITH Fl. brit. 1254 (1804), Eng. Bot. t. 2070. TURN. Musc. hib. 50 (1804). SCHWAEG. Suppl. I, P. I, 137, t. 35 (1811). ROEHL. Deutsch. fl. iii, 78 (1813). WAHLENB. Fl. carp. 338 (1814), Fl. upsal. 375 (1820). HOOK. TAYL. Musc. br. 31, t. 12 (1818). GRAY Nat. arr. br. pl. i, 723 (1821). HOOK. Fl. scot. P. 2, 127 (1821), Br. fl. ii, 45 (1833). MACK. Fl.

hib. P. 2, 26 (1836). DE NOT. in Mem. ac. Torin. xl, 290 (1838), Syllab. 171 (1838), Musc. ital. I, 35, t. 14 (1862), Epil. bri. ital. 538 (1869). WILS. Bry. brit. 134, t. 12 (1855). BERK. Handb. br. m. 250, t. 22, f. 4 (1863). LINDB. de Tort. 246 (1864). HOBK. Syn. br. m. 71 (1873).

Syntrichia ruralis BRID. in Schrad. Journ. iii, P. 2, p. 299 (1801), Mant. 98 (1819), Bry. univ. i, 584 (1826). WEB. MOHR Bot. Tasch. 215 (1807). VOIT Musc. herb. 52 (1812). Mart. Fl. cr. erl. 88 (1817). SCHULTZ Recens. 229, t. 34, f. 3 (1823). HUEBEN. Musc. germ. 338 (1833). JURATZ. Laubm. oesterr.-ung. 143 (1882).

Dioicous; in loose tall expanded tufts, ferruginous below, deep green and hoary above, dichotomously branched. Leaves remote, crowded at apex, carinate, from a long erect subvaginant base, recurvo-squarrose from the middle, appressed and twisted when dry, oblong, elongated, apex rounded or emarginate, margin revolute almost to apex; nerve red, excurrent in a flexuose hoary spinulose arista; cells at base rectangular, hyaline, above soft, hexagonal, coarsely papillose. Seta long, purple at base, yellowish above, calyptra large, fuscescent; caps. erect, elongated, cylindraceous, a little curved, brown, pachydermous; annulus double, lid red, suboblique, elongate-conic; per. very long, the lower half tubular, pale, spirally tessellated, teeth purple, contorted.

Male plant more slender. Infl. terminal, gemmaceous, inner bracts ovate, nerved, submuticous.

HAB.—On old thatched roofs, sandy banks and walls; rarely on trunks of trees, common. Fr. 4—5.

Var. *β.* **arenicola** *Braithw.*

Plants taller, more slender, yellow-green. Leaves more distant, longer, of thinner texture, becoming narrowed toward the apex, the point shortly acuminate in a scarious membrane, prolonged on the arista and sometimes denticulate at the margin.

SYN.—*Barbula ruraliformis* BESCH. in Musci Gall. n. 457. HUSNOT Mouss. nord-ouest 2 ed. 79.

HAB.—Sandy ground near the coast.

St. Andrew's Links (*Braithwaite* 1865)!! Southport (*Holt* 1879)!! Cromer (*H. N. Dixon* 1884)!!

The recurved leaves with revolute margins best distinguish this species, and Lindberg also describes as peculiar to it two longitudinal plaits, just within the margin of the leaf. *Barbula pulvinata* JURATZ. is intermediate between *montana* and *ruralis*, though the structure of the leaf agrees better with the latter, of which it must probably be regarded as a variety.

Tortula norvegica (WEB. 1804). *Barbula aciphylla* BRUCH SCHIMP. 1842, is a close ally of *ruralis* resembling our Var. *β.* but has a green nerve running out into a reddish brown rigid arista only faintly spinulose. It is confined to mountain regions, but may turn up here as it reaches to the Dovrefjeld and Lapland.

21. TORTULA PRINCEPS *De Not.*

Synoicous; tall, rufescent. Leaves patent, broadly oblong-ovate, obtuse, nerve excurrent in a slender spinulose arista. Caps. erect, cylindric; peristome with a long tube. (T. XXXIII, C.)

SYN.—*Tortula princeps* DE NOT. in Mem. ac. Torin. xl, 288 (1838), Syllab. 170 (1838), Musc. ital. I, 33, t. 13 (1862), Epil. bri. ital. 537 (1869). LINDB. de Tortulis 247 (1864). HOBK. Syn. br. m. 70 (1873).

Syntrichia Muelleri BRUCH MSS.

Barbula Muelleri BR. SCHIMP. Bry. eur. fasc. 13—16, Mon. 44, t. 28 (1842). SCHIMP. Synops. 192 (1860), 2 ed. 232. HUSN. Mouss. nord-ouest 87 (1873). LESQ. JAMES Mosses N. Amer. 133 (1884).

Barbula princeps C. MUELL. Synops. i, 636 (1849).

Tortula Muelleri WILS. Bry. br. 134, t. 44 (1855). BERK. Handb. br. m. 250 (1863).

Syntrichia princeps MITT. Journ. Lin. soc. i, Suppl. 39 (1859). JURATZ. Laubm. oesterr.-ung. 145 (1882).

Synoicous and polygamous; in tall lax ferruginous brown tufts. Stems repeatedly interrupted by innovations, dense-leaved, radiculose at base. Leaves imbricated patent, when dry appressed and complicate, rosulate at apex of innovations, broadly oblong-ovate, obtuse, concave, carinate in the middle, the margin subrevolute in the lower half; nerve rufous, excurrent in a slender hyaline faintly spinulose arista; cells at base lax, pellucid, above quadrate, not opake, soft, papilloso-scabrous. Caps. on a red flexuose seta, cylindraceous, arcuate, brown; annulus of a double series of cells, lid elongato-conic; per. pale, the lower half tubular, obscurely tessellated, teeth red.

Male infl. mixed with the female or sometimes with female infl. also on the same plant.

HAB.—On rocks, walls and sometimes trunks of trees; rare. Fr. 4—5.

Menstrie glen, Ochils (*Greville* 1855). Blair Atholl (*Miss McJnroy* 1859)!! Craiglockart, near Edinburgh (*Dr. B. White* 1865)! Ram rocks, Ben Wyvis (*Howie* 1864)! On the Cruise, Brechin and Menmuir (*Rev. M. Anderson* 1869)! Kirriemuir and Loch mill, Forfar (*Rev. J. Fergusson* 1866)!! Raith, Kirkcaldy, Fife, on weathered trap (*Ewing* 1885)!! Deer park, Glenarm, Antrim and Benbulben, Sligo (*Moore*).

This fine moss is easily known by its interrupted stem, and dense soft broad rusty-coloured leaves; its head quarters is the Mediterranean basin.

6. PLEUROCHÆTE LINDB.

Oefv. af kong. Vet. akad. foerh. xxi, 253 (1864).

Perichætia axillary, with the bracts accrescent inward. Fruit on an elongated seta, resembling that of *Tortula*, lateral, peristome scarce twisted. Leaves with a vaginant hyaline base, stellato-comant, serrate. Inhabiting barren stony places, especially near the sea. Der. πλευρα the side, χαιτη a seta.

PLEUROCHÆTE SQUARROSA (*Brid.*) *Lindb.*

Dioicous; laxly tufted. Leaves squarrose from a broad sheathing base, lanceolate, serrate at point. Setæ lateral, caps. subcylindric. (T. XXXIII, D.)

SYN.—*Barbula squarrosa* BRID. Bry. univ. i, 833 (1827). BRUCH SCHIMP. Bry. eur. f. 31, Suppl. t. 1 (1846). C. MUELL. Synops. i, 601 (1849). SCHIMP. Synops. 180 (1860), 2 ed. 221. BERTOL. Fl. ital. cr. 207 (1858). MILDE Bry. siles. 124 (1869). HUSN. mouss. nord-ouest 84 (1873). JURATZ. Laubm. oesterr.-ung. 124 (1882). LESQ. JAMES Mosses N. Amer. 130 (1884).

Tortula squarrosa DE NOT. in Mem. ac. Torin. xl, 321 (1838), Syllab. 180 (1838), Musc. ital. I, 61, t. 31 (1862). SPRUCE in HOOK. L. journ. iv, 193 (1845), et Ann. Mag. n. h. 2 ser. iii, 377 (1849). WILS. Bry. brit. 126, t. 33 (1855). MITT. Journ. Lin. soc. i, Suppl. 27 (1859). BERK. Handb. br. m. 255 (1863). HOBK. Syn. br. m. 74 (1873).

Pleurochæte squarrosa LINDB. de Tort. 253 (1864). DE NOT. Epil. bri. ital. 560 (1869).

Dioicous; laxly and irregularly cæspitose, tufts yellow-green above, fuscescent at base, fragile, not tomentose. Stem simple or dichotomous. Leaves comant at apex of stem, from a broad sheathing base, recurvo- and incurvo-squarrose, flaccid and cirrato-crispate when dry, elongate-lanceolate, subundulate at margin, serrate above, nerve thick, vanishing at apex or excurrent; areolation minute, chlorophyllose and rectangular above and at mid base, very finely papillose, at sides of base thin lax and hyaline. Perichætia numerous, lateral, the bracts shorter, semivaginant, reflexed: seta red below, yellowish above, calyptra very narrow, fugacious, caps. erect, cylindraceous, subarcuate, deep rufous, annulus narrow of a single series of cells, lid conico-subulate, per. pale purple, twice convolute, fugacious, teeth very slender, short-jointed, strongly papillose.

HAB.—Bare stony ground on the south coast and in chalky fields. Fr. 5—6.

Beeding chalk-pit, Sussex (*Borrer*). Shoreham beach (*Wilson* 1837)!! Woolsonbury hill (*Mitten*). Between Brighton and Newhaven (*Davies* 1868)!! Tothill, Plymstock, St. Minver and Berryhead (*Holmes*)!! Minehead, Somerset (*Boswell* 1867)!! Holton, Oxford (*Boswell*)!! Portmarnock, Dublin (*Taylor*). Arklow, Wicklow (*Moore*). Winchelsea (*Holmes*). Ballard down, Swanage (*Holmes*). Lathkill dale, Derbyshire (*Whitehead* 1882)!! Holton stone pits, Oxford (*Boswell*)!!

For the beautiful fertile specimen figured, I am indebted to my friend Mr. Boswell, in this country it is always sterile. There is something in the look of the plant very different from all our other species and approaching that of *Leptodontium*.

7. MOLLIA SCHRANK.

Baiers. Fl. ii, 455 (1789).

Plants dwarf or tall, cæspitose or pulvinate, dichotomously branched. Leaves lanceolate, papillose, bright or dark green, usually crisped or contorted when dry, the areolation lax and hyaline at base, minute obscure and chlorophyllose above. Capsule in a few cases

with an adherent lid, or gymnostomous, the mouth being sometimes closed by a membrane, or with a peristome consisting of a narrow basal membrane supporting 16 teeth, more or less developed, papillose, cleft to base into two equal or irregular legs, straight or occasionally contorted. Inhabiting the ground, walls or rocks.—Der. after K. E. von Moll, Archbishop of Salzburg, author of "Naturhist. Briefe ueber Salzburg" (1785).

The genus *Mollia*, founded by Schrank as an equivalent to *Tortula* or *Barbula*, may well be retained for this group, as *Trichostomum* was established by Hedwig in 1782, for the section of *Grimmia* named *Rhacomitrium* and some species of *Ditrichum*, and it was not until more than 20 years after this that any of the species now referred to *Trichostomum* were brought into it.

Taken as a whole, we must look upon the genus *Mollia* as an eminently natural one, ascending from several little phascoid mosses, through a series of closely allied forms, to the taller species culminating in *M. tortuosa*, all marked by their narrow opake papillose leaves, curled or twisted when dry, and a peristome of one common type, presenting various stages of development. A little study of the species will soon convince the student that *Systegium*, *Weissia*, *Gymnostomum*, *Didymodon*, *Hymenostomum*, *Eucladium*, *Gyroweissia*, *Leptobarbula* have no sound basis as genera, but may be readily distributed in the three sections adopted.

Hymenostomum stands to *Mollia* almost exactly in the same relation as *Pottia* does to *Tortula*, and we see in the species it includes, only miniatures of the larger forms of the third section, and just as closely allied to each other as certain *Pottias* are.

In *Tortella* a very important character may be noticed in the relation of the two kinds of cells composing the leaf base, in some species the white thin elongated hyaline cells meet the small chlorophyllose cells at the same level from nerve to margin, in others at a certain height, the hyaline cells leave the nerve and ascend obliquely outward to the margin, so that the demarcation between the two is very distinct.

Besides the continental species incidentally referred to in the text, the second edition of Schimper's Synopsis contains a number of others, both in this genus and the last, which it may be useful to enumerate, as attention is thus drawn to them, though except *Tortula cernua* and *inermis*, it is not probable that any of them will be met with here.

Under *Tortula* in the section *Desmatodon*, we find *T. squamigera* (Viv.), *B. membranifolia* Schultz,—*T. crassinervis* De Not., *B. chloronotos* B. & S.—*Guepini* B. & S.—*anomala* (B. & S.)—*barbuloides* (Brid.)—*flexiseta* (Brucii.)—*systylia* (B. & S.)—*latifolia* (Hedw.)—*cernua* (Hueben.),—*limbata* (Lindb.)—*obtusifolia* Schleich. *D. flavicans* (B. & S.),—*Solmsii* Schimp. the last three near *T. marginata;* in *Zygotrichia*, *T. Laureri* (Schultz) and *T. suberecta* Hook., *D. obliquus* B. & S. and in *Syntrichia*, *T. alpina* (B. & S.)

Under *Mollia* in Sect. *Hymenostomum*, we have *M. muralis* (Spruce).—*crispata* (Nees Hornsch.),—*Wimmeri* (Sendtn.),—*Welwitschii* (Schimp.),—*triumphans* (De Not),—*Monspeliense* (Schimp.)—*berica* (De Not.),—*meridionalis* and *Winteri* (Schimp.); in *Eucladium*, *M. reflexa* (Brid.) near *tenuis*,—*Philiberti*

(SCHIMP.)—*pallidiseta* (H. MUELL.),—*undata* (SCHIMP.), all near *M. crispula*, and *cuspidata* (SCHIMP.), and *Bambergeri* (SCHIMP.), near *brachydontia;* in *Tortella*, *M. humilis* (HEDW.), *B. cæspitosa* (SCHWAEG.) near *flavo-virens*, and *inflexa* (BRUCH), near *inclinata*.

It is very probable that several of these, on careful examination, will not be able to hold their ground as species.

CLAVIS TO THE SPECIES.

Sect. 1. HYMENOSTOMUM. Plants small, nearly simple; leaves linear or lanceolate; caps. with a persistent lid, or closed by an epiphragm, or gymnostomous, or with a peristome of 16 small teeth.

Capsules immersed, lid not falling off.	
Leaves lanceolate-subulate, with involute margins.	*crispa.*
Leaves lanceolate acute, with plane margins.	
Leaves recurved, perich. bracts long erect.	*multicapsularis.*
Leaves patent, perich. bracts shorter spreading.	*Mittenii.*
Capsule exserted, lid falling off.	
Leaves with plane margins.	
Capsule not elevated above perich. bracts.	*rostellata.*
Capsule elevated on a longer seta.	
Gymnostomous, leaves squarrose.	*squarrosa.*
Peristomate, leaves erecto-patent.	*rutilans.*
Leaves with involute margins.	
Gymnostomous, slightly branched, lax leaved.	*microstoma.*
——— repeatedly branched, dense leaved.	*tortilis.*
Peristomate, leaves linear-lanceolate.	*viridula.*

Sect. 2. EUCLADIUM. Plants larger, dichotomously branched; leaves accrescent upward and comant, fragile, thick nerved; peristome O, or of 16 slender papillose teeth.

Nerve vanishing below apex.	
Stem short, leaves lingulate obtuse.	
Loosely matted, lid conical.	*tenuis.*
Densely pulvinate, lid rostrate.	*calcarea.*
Stem elongated, leaves linear-lanceolate, rather obtuse.	*æruginosa.*
Nerve excurrent.	
Leaf with basal margin serrate.	*verticillata.*
Leaf with basal margin entire.	
Apex cucullate, boat shaped.	*crispula.*
—— flat, obtuse mucronate.	*litoralis.*
—— flat, acute acuminate.	*brachydontia.*

Sect. 3. TORTELLA. Plants robust, dense-leaved; leaves long, cirrhato-crispate when dry, hyaline at base. Peristome of longer teeth, sometimes twisted.

Basal hyaline cells not extending higher up the margin than at the nerve.	
Leaves long linear undulate, base equal, margin coarsely crenulate.	*tenuirostris.*
Leaves shorter lanceolate subulate, not undulate, base wider upward, margin entire.	*hibernica.*
Basal hyaline cells ascending higher at the margin.	
Apex of leaf obtuse, cucullate.	*flavo-virens.*
Apex of leaf acute.	
Leaves short with short points.	
Leaves rigid, with reddish nerve, arcuato-incurved when dry.	*nitida.*
Leaves soft, with green nerve, cirrhato-crispate when dry.	*inclinata.*
Leaves long with lanceolate-subulate points.	
Leaves flexuose, flaccid, undulate.	*tortuosa.*
Leaves erect rigid, straight.	*fragilis.*

Sect. 1. HYMENOSTOMUM (*Brown*). Plants small, simple or with a few innovations; leaves linear or lanceolate. Capsule phascoid with a persistent lid, or exserted and gymnostomous with or without an epiphragm, or with a peristome of 16 more or less perfect lanceolate teeth.

1. MOLLIA CRISPA (*Hedw.*) *Lindb.*

Autoicous, cæspitulose, branched at apex. Perich. bracts lanceolate-subulate, carinate, with involute margins, crisped when dry. Caps. spherical, immersed, lid minute, persistent. (T.XXXIII, E.)

SYN.—*Phascum crispum* HEDW. Fund. musc. II, 85 (1782), Musc. frond. i, 25, t. 9 (1787). Sp. musc. 21 (1801). SCHRANK Bayer. fl, ii, 433 (1789). HOFFM. Deutsch. fl. ii, 20 (1795). BRID. musc. rec. II, P. I, 19 (1798), Sp. musc. I, 10, (1806), Mant. 9 (1819), Bry. univ. i, 46 (1826). ROTH Fl. germ. iii, P. I, 111 (1800). ROEHL. Moosg. deutsch. 34 (1800), Ann. Wett. ges. i, 139 (1809), Deutsch, fl. iii, 34 (1813). DICKS. Pl. crypt. fasc. IV, 2 (1801). SMITH Fl. brit. iii, 1151 (1804), Eng. Bot. t. 1680. TURN. Musc. hib. 2 (1804). P. BEAUV. Prodr. 82 (1805). SCHULTZ Fl. starg. 274 (1806). WEB. MOHR Bot. Tasch. 64 et 477 (1807). SCHKUHR Deutsch. kr. gew. P. II, 6, t. 2 (1810). SCHWAEG. suppl. I, P. I, 1 (1811). VOIT Musc. herb. 5 (1812). LA PYL. Journ. Bot. 1813, p. 281. MART. Fl. crypt. erl. 125 (1817). HOOK. TAYL. Musc. brit. 6, t. 5 (1818). CASSEB. Ann. Wett. ges. iv, 94 (1819). HOOK. Fl. scot. P. II, 121 (1821). Br. flora ii, 2 (1833). FUNCK Moostasch. 1, t. 1 (1821). GRAY Nat. arr. br. pl. i, 711 (1821). NEES HNSCH. Bry. germ. i, 57, t. 4. f. 13 (1823). HUEBEN, Musc. germ. 7 (1833). MACK. Fl. hib. P. 2, 7 (1836). BR. SCH. Bry. eur. fasc. 1, p. 13, t. 6 (1837). DE NOT. Syllab. 308 (1838). RABENH. Deutsch. kr. fl. ii, S. 3, 81 (1848). C. MUELL. in Bot. zeit. 1847, p. 98; Synops. I, 24 (1849). WILS. Bry. brit. 37, t. 5 (1855). HOBK. Syn. br. m. 30 (1873).

Astomum crispum HAMPE Bot. zeit. 1832. SCHIMP. Bry. eur. fasc. 43, t. 1 (1850). JAEG. Ber. st. Gall. nat. ges. 1869, p, 69. LESQ. JAMES Mosses N. Amer. 51 (1884).

Weissia crispa MITT. Ann. mag. n. h. 2 ser. viii, 316 (1851). LINDB. de Tort. 230 (1864). MILDE Bry. siles. 43 (1869).

Weissia longifolia MITT. op. c. 317.

Systegium crispum SCHIMP. Synops. 31 (1860). BERK. Handb. br. m. 296 (1863). DE NOT. Epil. bri. ital. 740 (1869). HUSN. Mouss. nord-ouest 37 (1873), Muscol. gall. 4, t. 1 (1884). JURATZ. Laubm. oesterr.-ung. 7 (1882).

Simophyllum crispum LINDB. Rev. crit. ic. fl. dan. 38 (1871).

Mollia crispa LINDB. Musc. scand. 22 (1879).

Autoicous, gregarious or cæspitulose, fastigiate, branched at top, dull green. Leaves cirrhoso-crispate when dry, erecto-patent when moist, cauline distant, lanceolate, short, upper densely comant, long lineal-lanceolate, densely and minutely papillose at back, margin involute, nerve strong, excurrent in a mucro, basal cells smooth, hyaline, elongate hexagonal, upper minute roundish quadrate, obscure. Caps. immersed, subglobose, fuscous, lid minute, conic, easily separable.

Male infl. gemmiform, near the top of stem, bracts ovato-lancolate, acute.

HAB.—By the edge of paths in woods and clay fields, especially in calcareous districts; not uncommon. Fr. 4—5.

Frequent in Surrey and Sussex. Darlington (*Backhouse*). Beverley, Yorks. (*Teesdale*). Bedford (*Abbot*). Kilcullen bridge, Ireland (*Brown*). Plymouth (*Holmes*).

Var. *β.* **aciculata** (*Mitt.*)

Plants more slender; perich. bracts more attenuated, very acute, the margins erect, not involute. Caps. almost sessile and covered by the bracts, lid shorter.

SYN.—*Weissia aciculata* MITT. Ann. mag. n. h. 2 ser. viii, 318 (1851).

HAB.—Roadside at Hurstpierpoint (*Mitten*)!

In this little moss we have the first departure from the cleistocarpous state, where the operculum is organically united with the capsule wall, for although in *M. crispa* the lid does not fall off, a very slight lateral pressure when moist is sufficient to remove it. The large perich. bracts are characteristic of this and the next two species.

2. MOLLIA MULTICAPSULARIS (*Sm.*)

Autoicous; laxly tufted, tall, ascending. Leaves distant, spreading, recurved, lanceolate, with plane margins; perich. long, slender, erect. Caps. roundish ovate, immersed, rostellate. (T. XXXIII, F.)

SYN.—*Phascum sphærocarpon* ABBOT Fl. Bedf. 230 (1798).

Phascum crispum SMITH Eng. Bot. t. 618 (1799).

Phascum multicapsulare SMITH Fl. brit. iii, 1152 (1804). BRID. Sp. musc. I, 10 (1806), Mant. 10 (1819), Bry. univ. i, 48 (1826). LA PYL. Journ. Bot. 1813, p. 281. WILS. Bry. brit. 37, t. 37 (1855).

Phascum crispum β. multicapsulare HOOK. TAYL. Musc. Brit. 6 (1818).

Astomum multicapsulare SCHIMP. Bry. eur. fasc. 43, t. 3 (1850). JAEG. Ber. St. Gall. nat. gesells. 1869, p. 70.

Weissia multicapsularis MITT. in Ann. mag. n. h. 2 ser. viii, 317 (1851). LINDB. de Tort. 230 (1864).

Weissia convolutacea MITT. MSS. (Perich. bracts convolute at base).

Systegium multicapsulare SCHIMP. Synops. 33 (1860). BERK. Handb. br. m. 297 (1863). HUSN. Mouss. nord-ouest 38 (1873), Musc. gall. 5, t. 1 (1884).

Autoicous; laxly tufted or gregarious, dingy green. Stems ½—¾ in. high, from a procunbent base, erect, simple or dichotomous, with flexuose, small leaved innovations. Stem-leaves distant, patulous, recurved from the middle, flexuose, flaccid, oblongo- and elongato-lanceolate, apiculate, margin plane, comal leaves and perich. bracts much longer, incurved and slightly crisped when dry, erect, lineal-lanc. plane, channelled in the middle, lurid green, nerve dilated at base, semiterete above, vanishing in apex or slightly excurrent. Caps. immersed ovato-elliptic, lid subobliquely rostellate. Male infl. terminal on a branch, gemmiform.

HAB.—Clay fields and bare ground; rare. Fr. 3.

Clapham park wood and Ampthill, Bedford (*Abbott* 1798). Appleton, Cheshire (*Wilson* 1836)!! Darlington (*Backhouse*). Hurstpierpoint (*Mitten*)! Railway bank at Ashley (*Hunt* 1870)! Leckhampton hill, Chelmsford. Sutton park, Warwick (*Bagnall* 1877)!!

Differs from *crispa* by its size and dingy colour, the perich. bracts broader and longer, straight, lanceolate, less crisped when dry, more suddenly subulate from a dilated base; occasionally two capsules are found in one perichætium, but the specific name is certainly not an apt one.

The plant has the shabby dirty look, often seen in *Archidium*.

3. MOLLIA MITTENII (*Br. Sch.*) *Braithw.*

Autoicous and polygamous, taller. Leaves broadly lanc. recurved, more rigid, nerve vanishing at apex, perich. bracts lanceolate, shorter, divergent. Caps. ovate. (T. XXXIII, G.)

SYN.—*Astomum Mittenii* BR. SCH. Bry. eur. fasc. 43, t. 2 (1850). JAEG. Ber. St. Gall. nat. gesells. 1869, p. 70.

Hymenostomum sphæricarpon MITT. in lit.

Weissia Mittenii MITT. Ann. Mag. n. h. 2 ser. viii, 317 (1851).

Phascum multicapsulare Var. β. *Mittenii* WILS. Bry. brit. 37 (1855).

Systegium Mittenii SCHIMP. Synops. 32 (1860). BERK. Handb. br. m. 297 (1863).

Autoicous and polygamous; stem taller, flexuoso-erect, simple or branched, brownish. Leaves squarrose and recurved, rigid, broadly lanc. the comal few lineal-lanc. shorter, divergent, margin not involute, nerve thick, terete, fuscous, vanishing in the apex; perich. bracts lanceolate, thinner with a narrower nervè. Caps. emergent, on a longer pale pedicel, solitary, ovate, lid minute, conic rostellate. Male at base of fertile innovation.

HAB.—Clay banks at Hurstpierpoint, and in a stubble field at Little-ease (*Mitten* 1846)! Fr. 3.

This differs from *M. multicapsularis* by the shorter more rigid leaves, scarcely curling, the perich. bracts fewer, shorter, patent from the middle, broader and thinner, the shorter caps. with larger spores. The force of Mr. Wilson's reasoning that this is a var. of *M. multicapsularis*, because the following year that species only was found, is not apparent.

4. **MOLLIA ROSTELLATA** (*Brid.*) *Lindb.*

Autoicous; in small tufts. Leaves linear-lanc. spreading, crisp when dry, mucronate with the excurrent nerve, margin plane. Caps. elliptic, rostellate, scarcely exserted. (T. XXXIV, A.)

SYN.—*Phascum rostellatum* BRID. Mant. 11 (1819), Bry. univ. i, 46 (1826). NEES HORNSCH. Bry. germ. i, 59, t. 6, f. 14 (1823). SCHWAEGR Suppl. III, P. II. t. 296 (1830). BR. SCHIMP. Bry. eur. fasc. 1, p. 13, t. 6 (1837). RABENH. Deutsch. kr. fl. ii, S. 3, 83 (1848). C. MUELL. Syn. i, 24 (1849). WILS. Bry. brit. 38, t. 38 (1855). HOBK. Syn. br. m. 31 (1873).

Hymenostomum microstomum β. *mutilatum* HUEBEN. musc. germ. 67 (1833).

Hymenostomum obliquum WILS. Eng. Bot. Suppl. t. 2831.

Hymenostomum phascoides WILS. MSS. SCHIMP. Bry. eur. fasc. 42, t. 1 (1850).

Astomum rostellatum SCHIMP. Bry. eur. fasc. 43, t. 1 (1850).

Gymnostomum rostellatum SCHIMP. Synops. 33 (1860). BERK. Handb. br. m. 296 (1863). HUSN. mouss. nord-ouest 39 (1873).

Hymenostomum rostellatum SCHIMP. Synops. 2 ed. 33 (1876). HUSN. musc. gall 5, t. 2 (1884).

Weissia rostellata LINDB. De Tort. 230 (1864). MILDE Bry. siles. 43 (1869). JURATZ. Laubm. oesterr.-ung. 8 (1882).

Mollia rostellata LINDB.

Autoicous; in small lax, dingy green tufts, 1—3 lines high. Leaves spreading, entire, crisped when dry, lower lanc. upper linear-lanc. long, erecto-patent, flexuose, nerve excurrent in a short mucro, margin plane, cells at base hexagono-rectang. narrow at margin, above minute, quadrate, opake, minutely papillose on both sides. Caps. not elevated above perich. bracts, olive brown, elliptic, obliquely rostellate.

Male infl. gemmiform.

HAB.—Dried mud at edge of pools; rare. Fr. 10—3.

Mere, Cheshire (*Wilson* 1834)!! Newcastle Town-moor (*Robinson and Thornhill*). Edge of a fishpond at Hurstpierpoint (*Mitten* 1847)!! Weald of Sussex (*Davies* 1872)!!

This little moss bears fruit richly, and carries us onward a step higher from the cleistocarpous mosses to those with a dehiscent lid and peristome. Like other similar species it often disappears altogether from the locality it occupied.

5. **MOLLIA MICROSTOMA** (*Hedw.*) *Lindb.*

Autoicous; in short dense tufts. Leaves lanceolate, crisped when dry, acute, nerve excurrent, margin incurved. Caps. elliptic, contracted at the mouth, closed by a perforated membrane, lid obliquely rostrate (T. XXXIV, B.)

SYN.—*Gymnostomum microstomum* HEDW. Stirp. Cr. iii, 71, t. 30, B (1792), Sp. musc. 33 (1801). HOFFM. Deutsch. fl. ii, 29 (1795). BRID. Musc. rec. II, P. I, 44 (1798), Sp. Musc. I, 33 (1806), Mant. 15 (1819). SWARTZ Musc. Suec. 21 (1799). ROEHL. Moosg. deutsch. 79 (1800). ROTH Fl. germ. iii, P. I, 128 (1800). SMITH Fl. brit. iii, 1165 (1804), Eng. Bot. t. 2215. P. BEAUV. Prodr. 59 (1805). SCHULTZ Fl. starg. 279 (1806). WEB. MOHR Bot. Tasch. 85 (1807). SCHWAEGR. Suppl. I, P. I, 28 (1811). HOOK. TAYL. Musc. brit. 13, t. 7 (1818). HARTM. Skand. fl. 283 (1820). GRAY Nat. arr. br. pl. i, 716 (1821). FUNCK Moost. 7, t. 4 (1821). HOOK. Fl. scot. P. II, 123 (1821), Br. Fl. ii, 10 (1833). MACK. Fl. hib. P. 2, p. 11 (1836). WILS. Bry. brit. 44, t. 7 (1855). SCHIMP. Synops. 34 (1860). BERK. Handb. br. m. 295 (1863). HUSN. Mouss. nord-ouest 39 (1873). HOBK. Syn. br. m. 33 (1873).

Bryum microstomum DICKS. Pl. crypt. Fasc. IV, 9 (1801).

Hymenostomum microstomum R. BROWN Trans. Linn. Soc. xii, 572 (1819). NEES HORNSCH. Bry. germ. i, 139, t. 12, f. 4 (1823). BRID. Bry. univ. ii, 77 (1827). HUEBEN. Musc. germ. 67 (1833). DE NOT. Syllab. 293 (1838). Epil. bri. ital. 607 (1869). BR. SCHIMP. Bry. eur. fasc. 33—36, p. 4, t. 1 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 123 (1848). SCHIMP. Synops. 2 ed. 34 (1876). HUSN. Musc. Gall. 6, t. 2 (1884).

Weisia microstoma C. MUELL. Synops. i, 660 (1849). Fl. danica t. 2612, fig. 1. LINDB. De Tort. 230 (1864). MILDE Bry. siles. 44 (1869). JURATZ. Laubm. oesterr.-ung. 9 (1882).

Simophyllum microstomum LINDB. Rev. crit. icon. fl. dan. 74 (1871).

Mollia microstoma LINDB. Musc. scand. 22 (1879).

Autoicous; densely tufted, lurid green. Leaves lanceolate from an erect base, patent, twisted and crisped when dry, comal elongato-lanc. concave, the margin incurved, mucronate with the excurrent nerve; cells at base elongate hexagonal, above minute, opake. Caps. exserted on a yellowish seta, oval or elliptic, equal or gibbous, olivaceous when filled with spores, pale brown when empty, mouth very narrow, the closed orifice finally perforated in the centre; lid paler, more or less elongated, acute obliquely rostrate, annulus simple. Male infl. near the female, gemmiform.

HAB.—On banks and barren fields, not uncommon. Fr. 3—4.

Var. *β.* **obliqua** (*Nees Hornsch.*)

Plants shorter with a shorter seta; caps. asymmetric, incurved, lid more conical.

SYN.—*Hymenostomum obliquum* NEES HORNSCH. Bry. germ. 194, t. 12, f. 2. BRID. Bry. univ. ii, 75.

H. microstomum Var. β. obliquum. Bry. eur.

HAB.—Helk's wood, Ingleton (*Nowell* 1850)! !

The leaves of this species closely resemble those of *M. viridula*, and it is only by the small mouth of the capsule closed by the epiphragm that they can be separated; yet a character of such trivial weight is still used to establish genera, and separate species having the closest natural affinity.

6. **MOLLIA SQUARROSA** (*Nees Hornsch.*) *Lindb.*

Autoicous; in small lax tufts. Leaves squarrose, lanceolate, broader with plane margins. Caps. elliptic, lid conico-rostellate. (T. XXXIV, C.)

SYN.—*Hymenostomum squarrosum* NEES HORNSCH. Bry. germ. i, 193, t. 12, f. 1 (1823). BRID. Bry. univ. ii, 74 (1827). HUEBEN. Musc. germ. 69 (1833). BR. SCHIMP. Bry. eur. fasc. 33--36, p. 5, t. 2 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 124 (1848). SCHIMP. Synops. 2 ed. 34 (1876). HUSN. Musc. gall. 6, t. 2 (1884).

Weissia squarrosa C. MUELL. Synops. i, 663 (1849). LINDB. De Tort. 230 (1864). MILDE Bry. siles. 44 (1869). JURATZ. Laubm. oesterr.-ung. 8 (1882).

Gymnostomum squarrosum WILS. Bry. brit. 43, t. 38 (1855). SCHIMP. Synops. 34 (1860). BERK. Handb. br. m. 295 (1863). HUSN. Mouss. nord.-ouest. 39 (1873). HOBK. Syn. br. m. 33 (1873).

Mollia squarrosa LINDB. Musc. scand. 22 (1879).

Autoicous; in small lax deep green tufts. Stem $\frac{1}{3}$ in. high, becoming decumbent after fruiting, and throwing out innovations below the perichætium. Leaves distant, squarrose, dirty green, lanceolate, mucronate, margins erect not involute, upper comant, lineal-lanc. twice the length. Capsule small, elliptic, often oblique, brownish, on a short yellowish seta, lid conico-rostellate.

HAB.—Clay fields and banks; not common. Fr. 10—3.

Over, Cheshire (*Wilson* 1830)! ! Hurstpierpoint (*Mitten* 1846)! Hale barns and Ashley, Cheshire (*Hunt* 1868)! ! Bowdon, Cotterall wood, Helsby and Mobberley (*Hunt* 1870)! Handforth, Cheshire (*P. G. Cunliffe*). Buckingham (*Holmes*). Brant Fell, Westmoreland (*West* 1879)! ! Stirrup wood (*Scholefield* 1868). Penan, Braemar (*Sim* 1872).

Very close to *M. microstoma*, but best distinguished by the decumbent stem and squarrose leaves with plane margins.

7. **MOLLIA TORTILIS** (*Schwaegr.*) *Braith.*

Autoicous; densely tufted, fastigiate. Leaves crowded, oblong-lancelate, mucronate, with incurved margin. Caps. oval, equal, lid obliquely rostrate. (T. XXXIV, D.)

SYN.—*Gymostomum tortile* SCHWAEGR. in SCHRAD. Neu. Bot. journ. iv, 17, t. 1 (1810), Suppl. I, P. I, 29, t. 10 (1811). SCHKUHR Deutsch. kr. gew. P. II, 29, t. 11, c. (1810). BRID. Mant. 17 (1819), Bry. univ. i, 74 (1826). FUNCK Moost. 7, t. 4 (1821). NEES HORNSCH. Bry. germ. i, 182, t. 11, f. 28 (1823). HUEBEN. Musc. germ. 48 (1833). DE NOT. Syllab. 291 (1838). WILS. Bry. brit. 45, t. 38 (1855). SCHIMP. Synops. 35 (1860). BERK. Handb. br. m. 296 (1863). HUSN. Mouss. nord.-ouest. 40 (1873). HOBK. Syn. br. m. 33 (1873).

Gymnostomum condensatum VOIT in STURM Deutsch. fl. P. xi (1810), Musc. herbip. 14 (1812). ROEHL. Deutch. fl. iii, 37 (1813).

Hymenostomum tortile BR. SCHIMP. Bry. eur. fasc. 33—36, p. 6, t. 3—4 (1846). DE NOT. Epil. bri. ital. 606 (1869). SCHIMP. Synops. 2 ed. 35 (1876). HUSNOT Musc. gall. 6, t. 2 (1884).

Weissia tortilis C. MUELL. Synops. i, 661 (1849). MILDE Bry. siles. 44 (1869). JURATZ. Laubm. oesterr.-ung. 10 (1882).

Weissia condensa LINDB. de Tort. 230 in obs. (1864).

Autoicous; in more robust densely crowded tufts, dichotomous, fastigiate, dingy green above, rufescent below. Leaves crowded, appressed and twisting when dry, erecto-patent when moist, lower minute ovate, upper broadly lanc. obtusely pointed, mucronate with the stout excurrent nerve which is reddish in old leaves; margin incurved, subundulate, cells quadrate, diaphanous at base, opake above. Perich. bracts longer lanc.-subulate; caps. on a yellow seta, pachydermous, ovate or oblong, yellow-brown with a red mouth, annulus simple, lid conico-subulate, oblique, epiphragm perforated. Male infl. near the female, gemmaceous.

HAB.—Limestone rocks, banks and walls; rare. Fr. 3—4.

St. Michael's mount (*Greenwood*). Lathkilldale, Derby (*Wilson*, 1831)!! Cliffs, near Newhaven, and at Crowhurst (*Borrer*, 1837)! Plymouth (*Holmes*, 1867)!! Levens, Westmoreland (*Barnes*, 1874)!! Otford and Sandgate, Kent (*Holmes*). Bembridge, I. of Wight (*Davies*, 1865)! Marazion (*Curnow*).

Readily known from its allies by the broader rather obtuse leaves, erect and incurved when dry, and fasciculate at the top of each shoot. Mr. Holmes has noticed that it has a curious habit of detaching itself from the substratum it grows upon, and becoming loose.

8. **MOLLIA VIRIDULA** (*L.*) *Lindb.*

Autoicous; laxly cæspitose. Leaves crisped, linear-lanceolate, mucronate, involute at margin. Caps. oval, lid rostrate, teeth small, irregular, variable. (T. XXXIV, E.)

SYN.—*Bryum trichoides exile, erectis capitulis in pediculis brevissimis* DILL. Cat. Giss. 224 (1719), in RAY Synops. 3 ed. 97 (1724).

Bryum capillaceum breve, pallide et lœte-virens, capsulis ovatis DILL. Hist. musc. 380, t. 48, f. 43 (1741) et Herbar.

Bryum viridulum L. Sp. plant, ii, 1119 (1753), Syst. nat. ii, 702. HUDS. Fl. angl. 408 (1762). WEISS Crypt. Goett. 193 (1770). WITH. Bot. arr. br. Veg. ii, 676 (1776). LIGHTF. Fl. Scot. ii, 731 (1777). CURT. Fl. Lond. fasc. 2, 132, t. 70, f. 1 (1778). RELHAN Fl. cant. 405 (1785). HULL Br. Fl. P. 2, 258 (1799).

Weissia viridula HEDW. Fund, II, 90 (1781). LEYS. Fl. Hal. n. 1037 (1783). ROTH Fl. germ. i, 456 (1788). BRID. Musc. rec. II, P. I, 75 (1798), Mant. 38 (1819), Bry. univ. i, 334 (1826). BR. SCHIMP. Bry. eur. fasc. 33—36, p. 5, t. 2—3 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 125 (1848). C. MUELL. Synops. i, 651 (1849). SCHIMP. Synops. 50 (1860), 2 ed. 51. MILDE Bry. siles. 45 (1869). HUSN. Mouss. nord-ouest 42 (1873), Musc. gall. 12, t. 4 (1884). JURATZ. Laubm. oesterr.-ung. 11 (1882). LESQ. JAMES Mosses N. Amer. 55 (1884).

Bryum virens DICKS. Pl. crypt. I, 4 (1785). ABBOT Fl. bedf. 243 (1798).

Mnium viridulum SWARTZ Meth. musc. 365 (1787).

Weissia crispa TIMM Fl. megap. n. 736 (1788).

Afzelia crispa. EHRH. Crypt. exs. n. 222 (1790).

Weissia controversa HEDW. Musc. frond. iii, 13, t. 5, B. (1792), Sp. musc. 67 (1801). SWARTZ Musc. suec. 26 (1799). TURN. Musc. hib. 27 (1804). SCHKUHR Deutsch. kr. gew. P. II, 52, t. 25 (1810). SCHWAEGR. Suppl. I, P. I, 77 (1811). WAHLENB. Fl. carp. 340 (1814), Fl. ups. 384 (1820). ROEHL. Deutsch. fl. iii, 48 (1813), Ann. Wett. ges. iii, 98. HOOK. TAYL. Musc. brit. 47, t. 15 (1818), HOOK. Fl. scot. P. II, 131 (1821), Brit. fl. ii, 22 (1833). FUNCK Moost. 15, t. 10 (1821). GRAY Nat. arr. br. pl. i, 731 (1821). ZENK. DIETR. Musc. thuring. II, n. 45 (1822). NEES HORNSCH. Bry. germ. ii, P. 2, 42, t. 27, f. 7 (1831). HUEBEN. Musc. germ. 123 (1833). Fl. danica t. 2304, fig. 2. MACK. Fl. hib. P. 2, 15 (1836). DE NOT. Syllab. 234 (1838), Epil. bri. ital. 599 (1869). WILS. Bry. brit. 46, t. 15 (1855). BERK. Handb. br. m. 291 (1863). HOBK. Syn. br. m. 33 (1873).

Grimmia controversa SCHRAD. Samml. SIBTH. Fl. oxon. 277 (1794). SMITH. Fl. brit. iii, 1187 (1804), Eng. Bot. t. 1367. WEB. MOHR. Bot. Tasch. 133 (1807). VOIT Musc. herb. 32 (1812).

Bryum controversum HOFFM. Deutsch. fl. ii, 32 (1795). P. BEAUV. Mem. Soc. Linn. Par. t. 5, f. 5 (1822).

Weissia virens BRID. Musc. rec. II, P. I, 69 (1798). ROEHL. Moosg. deutsch. 147 (1800).

Weissia microdonta et *Dicranum xanthodon* HEDW. Sp. musc. t. 11 & 30 (1801).

Weissia mutabilis BRID. Sp. musc. I, 103 (1806). MART. Fl. crypt. erl. 112 (1817).

Hymenostomum subglobosum NEES HORNSCH. Bry. germ. i, 103, t. 12 (1823). BRID. Bry. univ. ii, 79.

Weissia humilis, fallax et *Bruchiana* NEES HORNSCH. Bry. germ. ii, P. II, 36, t. 26—27 (1831).

Simophyllum viridulum LINDB. Rev. crit. icon. fl. danicæ 51 (1871).

Mollia viridula LINDB. musc. scand. 21 (1879).

Autoicous; short, laxly cæspitose or subpulvinate, bright green, nearly simple. Leaves when dry, involuto-crispate, when moist erecto-patent, the lower lanc. upper longer, comant, flexuoso-patulous, from an oblong concave base with plane margins, lineal lanc. the wings above connivent, involute at margin, nerve strong, yellowish excurrent in a short mucro; cells at base rectang. pellucid, above very minute, opake. Caps. on a rather short pale seta, erect, oval or oblong, occasionally subcylindric, rufescent or fuscous, when dry slightly contracted below the mouth and sulcate; annulus narrow, lid obliquely subulate, reddish at base, peristome very variable, teeth lineal-lanc. often truncate or cleft at apex; rufo-ferruginous, roughish at back, with 2—5 joints.

Male infl. terminal on the innovations, minute, gemmaceous, bracts ovate, acuminate.

HAB.—Banks, roadsides and sandy ground; common. Fr. 3—5.

Var. *β.* **amblyodon** *Brid.*

Leaves shorter, oblong-lanceolate; teeth pale, short and truncate or cloven at apex, lid shorter.

SYN.—*Weissia amblyodon* BRID. Bry. univ. i, 805. NEES HORNSCH. op. c. 52, t. 28.

W. gymnostomoides & microstoma NEES HORNSCH. op. c. 33, t. 25.

W. viridula, δ. amblyodon Bry. eur.

HAB.—Peaty soil.

Porth Dafarch (*Wilson* 1856)!! Milnthorpe, Syergh fell and Helsington Barrows (*Barnes* 1870)!! Malham cove (Nowell)! Plymstock (*Holmes*).

Var. *γ.* **gymnostomoides** *Brid.*

Teeth rudimentary, pale and truncate; leaves rather shorter; caps. small, elliptic.

SYN.—*W. gymnostomoides* BRID. Bry univ. i, 342.

W. Rudolphiana NEES HORNSCH. op. c. 31, t. 25.

W. viridula ε. *gymnostomoides* Bry. eur.

HAB.—Occasionally with the ordinary form.

Var. δ. **densifolia** *Wils.*

Densely tufted, stems taller, much branched; leaves crowded, narrower; seta often short, teeth imperfect.

SYN.—*W. densifolia Wils.* MSS.

W. viridula γ. *densifolia* Bry. eur. Bry. brit.

HAB.—Kenmare (*Wilson* 1829)! Rhayadr-y-Pare Mawr (*Wilson* 1845)!! Malham (*West* 1882)!!

Like all mosses of wide distribution, this is extremely variable in size as well as in the leaves and fruit, its most constant character being the involute margin of the leaves and small pale teeth, the latter often very unequal or with projecting lateral processes; occasionally the lid is longer than the capsule.

It is curious that while the description by Linneus of *Bryum viridulum* certainly refers to this plant, there is no specimen in his herbarium, the mosses there so named being *Fissidens viridulus*, *Pottia truncatula* and *Anisothecium rubrum*.

9. **MOLLIA RUTILANS** (*Hedw.*) *Lindb.*

Autoicous; leaves lanceolate, mucronate, with plane margins. Caps. oblong, substriate, teeth very short, truncate, fugacious. (T. XXXIV, F.)

SYN.—*Gymnostomum rutilans* HEDW. Sp. musc. 37, t. 3, f. 8—11 (1801). BRID. Sp. musc. I, 34 (1806), Mant. 16 (1819). SCHWAEGR. Suppl. I, P. I, 29 (1811).

Gymnostomum microstomum SCHULTZ Fl. starg. 279 (1806). WEB. MOHR Bot. Tasch. 85 (1807). SCHKUHR Deutsch. kr. gew. ii, P. II, 23, t. 10 (1810).

Hymenostomum rutilans NEES HORNSCH. Bry. germ. i, 201, t. 12, f. 5 (1823). BRID. Bry. univ. ii, 78 (1827). HUEBEN. Musc. germ. 70 (1833).

Weissia apiculata NEES HORNSCH. op. c. ii, P. II, 40, t. 26 (1831). RABENH. Deutsch. kr. fl. ii, S. 3, 126 (1848).

Weissia mucronulata BRUCH, SPRENG. L. Syst. Veg. iv, 158. HUEBEN. op. c. 124.

Weissia mucronata BR. SCHIMP. Bry. eur. fasc. 33—36, p. 7, t. 4 (1846). WILS. Bry. brit. 47, t. 38 (1855). SCHIMP. Synops. 52 (1860), 2 ed. 51. BERK. Handb. br. m. 292 (1863). MILDE Bry. siles. 46 (1869). HUSN. Mouss. nord-ouest. 42 (1873), Musc. gall. 13, t. 4 (1884). HOBK. Syn. br. m. 34 (1873). JURATZ. Laubm. oesterr.-ung. 12 (1882).

Weissia viridula s. *mucronata* C. MUELL. Synops. i, 652 (1849).

Mollia rutilans LINDB.

Autoicous; resembling *M. viridula*. Leaves broader with a longer mucro, the upper part very concave, with plane margins. Caps. oblongo-cylindraceous, fuscescent with ferruginous striæ and a red mouth; lid bright red, with a shorter beak; teeth broader, irregular, cleft, cribrose, very fugacious; spores twice the size.

HAB.—Clay soil in woods and shady places; not common. Fr. 3—4.

Hurstpierpoint (*Mitten*, 1847)! Lindfield, Falmer and Newtimber (*Davies*)!! Hattersley, Cheshire (*Whitehead* 1868)!! Forest hill (*George*). Whitstable (*Holmes*). Ashley mill (*Holt* 1884)!! Bowdon, Helsby and Oakmere (*Hunt* 1870)!! Whitbarrow (*Barnes* 1870)! Tregawn, near Withiel (*Tellam*). Menmuir and Caterthun (*Rev. M. Anderson*). Alton and Maxtoke, Warwick (*Bagnall*). Northumberland coast (*Hardy*). Rathmullen, Donegal (*Capt. Hutton*). Ben Laoigh (*Ewing*).

Sect. 2. EUCLADIUM (*Br. Sch.*) Plants larger, densely cæspitose, repeatedly dichotomous; leaves erecto-patent, lanceolate, rigid, fragile, with a thick nerve. Capsule erect, ovate, teeth linear-lanc. obliquate, flat punctulate, bi-trifid, or wanting.

10. MOLLIA TENUIS (*Schrad.*) *Lindb.*

Dioicous; very short. Leaves linear-lanc. obtuse, faintly crenulate, nerve vanishing below apex. Caps. erect, oblong, broadly annulate, gymnostomous, lid conical. (T. XXXIV, G.)

SYN.—*Gymnostomum tenue* SCHRAD. Samml. crypt. gew. n. 31 (1796), et in USTERI Neu. ann. xiv, 105 (1796). ROTH Fl. germ. iii, P. I, 127 (1800). HEDW. Sp. musc. 37, t. 4 (1801). P. BEAUV. Prodr. 60 (1805). BRID. Sp musc. I, 33 (1806), Mant. 13 (1819), Bry. univ. i, 64 (1826). WEB. MOHR Tasch. 86 (1807). SCHKUHR Deutsch. kr. gew. ii, P. II, 24, t. 11 (1810). SCHWAEGR. Suppl. I, P. I, 27 (1811). ROEHL. Deutsch. fl. iii, 39 (1813), Ann. Wett. ges. ii, 126. HOOK. TAYL. Musc. brit. 13, t. 8 (1818). GRAY Nat. arr. br. pl. i, 716 (1821). HOOK. Fl. scot. P. II, 123 (1821), Br. fl. ii, 10 (1833), NEES HORNSCH. Bry. germ. i, 151, t. 10, f. 14 (1823). HUEBEN. musc. germ. 46 (1833). MACK. Fl. Hib. P. 2, p. 11 (1836). BR. SCHIMP. Bry. eur. fasc. 33—36, p. 5, t. 2 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 121 (1848). WILS. Bry. br. 41, t. 7 (1855). SCHIMP. Synops. 38 (1860). BERK. Handb. br. m. 294 (1863). HUSN. Mouss. nord-ouest 40 (1873). HOBK. Syn. br. m. 31 (1873). JURATZ. Laubm. oesterr.-ung. 13 (1882). LESQ. JAMES Mosses N. Amer. 54 (1884).

Weisia tenuis C. MUELL. Synops. i, 660 (1849).

Trichostomum reflexum β. *gymnostomum* LINDB. de Tort. 230 (1864). MILDE Bry. siles. 108 (1869).

Gyroweissia tenuis SCHIMP. Syn. 2 ed. 38 (1876). HUSNOT musc. gall. 7, t. 2 (1884).

Mollia tenuis LINDB. musc. scand. 21 (1879).

Dioicous; in flat deep green tufts, very short, repeatedly divided from the base. Lower leaves linguiform, upper linear-lanc. obtuse, concave, nerve not reaching apex. Cells at base rectang. at margins paler, quadrate. Perich. bracts sheathing in lower half, then patent, thin-nerved, innermost paler, nerveless. Caps. oblongo-elliptic, ferruginous, finally bay color and glossy, the mouth red very glossy; annulus very broad. Calyptra reaching ⅓ down caps. lid conico-rostellate.

Males very dwarf, bracts ovato-lanc. obtuse.

HAB.—Rocks and stones of sandstone or limestone; not common. Fr. 7—8.

Near Glasgow (*Don*). Auchindenny and Den of Dupplin (*Arnott*). Timperley, Cheshire (*Wilson*)! Belfast (*Drummond*). Henfield (*Mitten*). Thirsk and Studley (*Baker* 1854)! Oxford and Blenheim park (*Boswell* 1862)!! Ashley mill and by R. Bollin (*Hunt* 1862)!! Park lane, Manchester (*Holt* 1882)!! Brandon Kerry (*Taylor*). Edgbaston (*Bagnall*).

11. MOLLIA CALCAREA. (*Nees Hornsch.*) *Lindb.*

Dioicous; compactly tufted, very slender, branched. Leaves linear lanc. entire, the nerve vanishing; cells minute quadrate, opake above. Caps. small oblong, scarcely annulate, lid obliquely subulate. (T. XXXV, A.)

SYN.—*Gymnostomum calcareum* NEES HORNSCH. Bry. germ. i, 153, t. 10, f. 15 (1823). BRID. bry. univ. i, 65 (1826). HUEBEN. Musc. germ. 48 (1833). DE NOT. Syllab. 291 (1838), Epil. bri. ital. 603 (1869). BRUCH SCH. Bry. eur. fasc. 33—36, p. 6, t. 3—4 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 121 (1848). SCHIMP. Synops. 39 (1860), 2 ed. 40 HUSN. Mouss. nord-ouest 40 (1873), Musc. gall. 8, t. 3 (1884). JURATZ. Laubm. oesterr.-ung. 14 (1882). LESQ. JAMES Mosses N. Amer. 53 (1884).

Weissia calcarea C. MUELL. Synops. i, 659 (1849).

Hymenostylium calcareum MITT. Journ Linn. soc. i, Suppl. 33 (1859).

Trichostomum calcareum LINDB. de Tort. 229 (1864). MILDE Bry. siles. 107 (1869).

Mollia calcarea LINDB.

Dioicous; short, very tender and slender, in densely compacted tufts, bright light green above, ferruginous below. Lower leaves very small, erecto-patent, narrowly lanc. upper much larger, lineal-lanc. rather obtuse, concave, margin very minutely crenulate, nerve stout, prominent at back, vanishing towards apex, cells minute quadrate. Perich bracts from a broader subvaginant laxly areolate base, lanceolate-subulate, patulous; caps. on a pale straw-coloured seta, erect, oblong, short-necked, pale brown with a red mouth, when empty, subcylindric truncate, slightly contracted below the mouth; annulus very narrow, persistent, lid conic with an acute oblique beak. Male plant more slender, infl. very minute, lateral, bracts ovato-acuminate.

HAB.—Calcareous rocks; very rare. Fr. 6—7.

Cheedale, Derbyshire (*Holmes* 1874)!! Monsal Dale, Ashwood Dale and Ravensdale c. fr. (*Holt* 1883)!!

Var. *β.* **viridulum** (*Brid.*)

Plants very short and slender, darker green, branched; lower leaves minute, remote, upper crowded, oblongo-lanc. shorter, recurved from the middle, subacute or muticous; caps. minute, ovate.

SYN.—*Gymnostomum viridulum* BRID. op. c. 66.

G. calcareum Var. *γ. viridulum* Bry. eur. l. c. t. 3.

G. calcareum Var. *δ. brevifolium* SCHIMP. Synops. 40.

HAB.—Damp rocks. Blackhall, Banchory (*J. Sim* 1871)!!

This moss is most striking by its lovely light green mats, and it is extraordinary that it should so long have escaped notice. Mr. Holt has had the good fortune to find it in fruit, which is only produced sparingly and in crevices away from the light. The plant is very variable in the fruit, the capsule being sometimes nearly globose, and in other cases subcylindric; the density of the stems is also in some cases so great as to attain an almost corky consistence.

12. MOLLIA ÆRUGINOSA (*Sm.*) *Lindb.*

Dioicous; densely tufted, dichotomously branched. Leaves lanceolate-linear, rather obtuse, crenulate with papillæ at base, nerve vanishing. Caps. oval, not annulate, lid rostrate. (T. XXXV, B.)

SYN.—*Gymnostomum æruginosum* SMITH Fl. brit. iii, 1163 (1804), Eng. Bot. t. 2200. BRID. Sp. musc. I, 36 (1806), Mant. 18 (1819), Bry. univ. i, 80 (1826). SCHKUHR Deutsch. kr. gew. ii, P. II, 25, t. 11 (1810).

Gymnostomum rupestre SCHLEICH. Cat. pl. helv. 29 (1807). SCHWAEGR. Suppl. I, P. I, 31, t. 10 (1811). BRID. Mant. 17, Bry. univ. i, 77. NEES HORNSCH. Bry. germ. i, 150, t. 10, f. 16 (1823). HOOK. TAYL. Musc. br. 2 ed. 19, Supp. t. 2 (1827). HUEBEN. Musc. germ. 49 (1833). MACK. Fl. hibern. P. 2, 10 (1836). HOOK. Br. fl. ii, 8 (1833). DE NOT. Syllab. 291 (1838), Epil. bri. ital. 603 (1869). BRUCH SCH. Bry. eur. fasc. 33—36, p. 7. t. 5—6 (1846). RABENH. Deutsch kr. fl. ii, S. 3, p. 122 (1848). WILS. Bry. brit. 41, t. 32 (1855). SCHIMP. Synops. 41 (1860). BERK. Handb. br. m. 294 (1863). HOBK. Syn. br. m. 32 (1873). JURATZ. Laubm. oesterr-ung. 15 (1882). LESQ. JAMES Mosses N. Amer. 53 (1884). HUSNOT Musc. gall. 9, t. 3 (1884).

G. articulatum SCHKUHR op. c. 29, t. 11. BRID. Mant. 18, Bry. univ. i, 78. NEES HORNSCH. op. c. i, 156, t. 10, f. 17.

G. stelligerum (non SMITH, nec DICKS. nec BRID.). NEES HORNSCH. op. c. 168, t. 11, f. 23.

G. rupestre Var. *stelligerum* Bry. eur. Bry. brit.

G. erythrostomum BRID. Bry. univ. i, 84.

Weissia rupestris C. MUELL. Synops. i, 657 (1849).

Trichostomum æruginosum LINDB. de Tort. 229 (1864).

Trichostomum rupestre MILDE Bry. siles. 106 (1869).

Mollia æruginosa LINDB. Musc. Scand. 21 (1879).

Dioicous; densely cæspitose, ½—3 in. high, slender, deep green above, fuscescent below, tomentose, dichotomously branched. fastigiate. Leaves accrescent, fasciculate, patent and curved upward, when dry erect and incurved, lower narrowly lanc. upper narrowly lineal-lanc. muticous, nerve thick yellowish, vanishing in the apex, margin plane, very minutely geminato-papillose; cells rectang. and pellucid at base, quadrate and minute above. Perich. bracts sheathing, laxly hexagono-reticulate at base; caps. leptodermous, on a shortish pale red seta, oval, short necked, when empty pale yellow, glossy, mouth rufous or blackish red, not annulate, lid conic, shortly rostrate, the beak pale. Male plant more slender, inner bracts ovate, fuscous.

HAB.—Wet rocks, especially in calcareous subalpine districts. Not uncommon. Fr. 8—9.

Var. *β.* **ramosissima** *Br. Sch.*

Compactly pulvinato-cæspitose, olivaceous-green. Plants very slender, very much branched, fragile; leaves short and narrow, more obtuse; capsules small, elliptic, lid conical.

HAB.—Castleton, Derbyshire (*T. Rogers* 1881)!! Millers Dale (*Holt* 1882)!!

This moss is of frequent occurrence among the limestone hills of the north of England, as well as in Scotland, forming dense mats of a deep rich green colour.

Although resembling *Barbula curvirostris* very much in habit, the areolation of the upper part of the leaf will at once distinguish them; in the present plant the cells are minute and opake, in *B. curvirostris* larger, empty and clearly defined. The Var. *stelligera* is merely a form with repeated innovations.

13. MOLLIA VERTICILLATA (*L.*) *Lindb.*

Dioicous; laxly tufted, dichotomously branched. Leaves from a broader base with toothed margin, lanceolate, narrow and subsubulate,

nerve stout, excurrent in a thick point. Caps. erect, oval, lid obliquely subulate, teeth 16 lineal-lanc. papillose, oblique. (T. XXXV, C.)

SYN.—*Bryum trichodes brevifolium, angustis cauliculis, capitulis erectis parvis et minus aduncis* DILL. in RAY Syn. stirp. br. 3 ed. 98 (1724).

Muscus trichodes aquaticus minimus, capitulis parvis erectis Richardson. RAY Syn. ibid.

Bryum pilosum verticillatum DILL. Hist. musc. 374, t. 47, f. 35 (1741), et Herbar.

Bryum angustissimis foliis crebrioribus capitulis erectis brevibus, pediculis e surculis novis et longis enascentibus DILL. in RAY Syn. 3 ed. 99.

Muscus palustris æstivus, capitulis parvis erectis, foliis dense stipatus Richardson. RAY Syn. ibid.

Bryum palustre æstivum, confervæ facie DILL. Hist. 375, t. 47, f. 36; et Herbar.

Bryum verticillatum L. Sp. plant. ii, 1120 (1753). Syst. nat. ii, 702. HUDS. Fl. angl. 411, *excl. var. β.* (1762). WITH. Bot. arr. br. veg. ii, 677 (1776). VILLARS Pl. dauph. iii, 877 (1786). ROTH Tent. fl. germ. i, 473 (1788). HULL Br. fl. P. II, 259 (1799). BRID. Musc. rec. II, P. III, 40 (1803).

Barbula atlantica BRID. musc. rec. II, P. I, 202, t. 6, f. 13 (1798), Mant. 93 (1819), Bry. univ. i, 559.

Grimmia verticillata SM. Fl. brit. iii, 1191 (1804), Eng. Bot. t. 1258. TURN. musc. hib. 31 (1804).

Grimmia fragilis WEB. MOHR Archiv. I, P. I, 129, t. 4, f. 4 (1804). SCHKUHR Deutsch. kr. gew. II, P. II, 55, t. 24 (1810).

Weissia verticillata BRID. Sp. musc. I, 121 (1806). SCHWAEG. Suppl. I, P. I, 71, t. 20 (1811). ROEHL. Ann. Wett. ges. iii, 110. HOOK. TAYL. Musc. br. 48, t. 15 (1818). FUNCK Moost. 14, t. 13 (1821). GRAY Nat. arr. br. pl. i, 732 (1821). NEES HORNSCH. Bry. germ. ii, P. II, 111, t. 35, f. 29 (1831). HUEBEN. Musc. germ. 147 (1833). HOOK. Br. fl. ii, 23 (1833). MACK. Fl. hib. P. II, 15 (1836). DE NOT. Syllab. 229 (1838). Epil. bri. ital. 598 (1869). C. MUELL. Synops. i, 656 (1849). WILS. Bry. brit. 49, t. 15 (1855). BERK. Handb. br. m. 293 (1863). HUSN. Mouss. nord-ouest 43 (1873). HOBK. Syn. br. m. 34 (1873).

Tortula atlantica BRID. Sp. musc. I, 255 (1806).

Weissia gypsacea SCHLEICH. Cat. pl. helv. 31 (1807).

Coscinodon verticillatus BRID. Bry. univ. i, 374 (1826).

C. elongatus BRID. op. c. 376.

Eucladium verticillatum BR. SCHIMP. Bry. eur. fasc. 33—36, Mon. p. 3, t. 1 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 130 (1848). SCHIMP. Synops. 134 (1860), 2 ed. 45. LINDB. de Tort. 231 (1864). MILDE Bry. siles. 109 (1869). JURATZ. Laubm. oesterr.-ung. 16 (1882). HUSNOT Musc. gall. 11, t. 3 (1884).

Hymenostylium verticillatum MITT. Journ. Linn. Soc. i, Suppl. 32 (1859).

Mollia verticillata LINDB. Musc. scand. 21 (1879).

Dioicous; densely tufted, repeatedly dichotomous, fastigiate, ½—2 in. high, pale glaucous green above, dirty white or fuscescent below, usually encrusted with calcareous deposit. Leaves lax rigid fragile, nearly smooth, erecto-patent, lanceolate-subulate, the base dilated, with the margin toothed, the cells lax pellucid, elongated, above irregularly quadrate; nerve stout, occupying nearly all apex. Caps. on a shortish purple seta, chesnut brown, erect, ovate or oval, pachydermous, annulus very narrow, lid obliquely subulate, teeth 16, deep orange, flat, slightly papillose, oblique, lineal-lanc. remotely articulate, entire or 2—3 fid.

Male plants more slender, infl. terminal, outer bracts ovali-lanceolate, inner acuminate, the nerve vanishing.

HAB.—Dripping calcareous rocks or occasionally on sandstone; not uncommon but unfrequent in fruit. Fr. 6—7.

Very variable in height and density, but easily recognised by the dentate basal margin of the leaf. Lindberg determined the *Hyssopus Salomonis* HASSELQUIST to be a variety of this with recurved leaves.

14. **MOLLIA CRISPULA** (*Bruch*) *Lindb.*

Dioicous; densely cæspitose. Leaves linear-lanceolate, with the apex incurved or cucullate, mucronate with the excurrent nerve, the margin incurved. Caps. erect ovate, lid with a long beak, teeth in pairs, unequal, very slender. (T. XXXV, D.)

SYN.—*Trichostomum crispulum* BRUCH in Flora xii, P. II, 395, t. 1, f. 4 (1829). DE NOT. Syllab. 191 (1838), Epil. bri. ital. 503 (1869). BR. SCH. Bry. eur. fasc. 18—20, Mon. 8, t. 5 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 114 (1848). C. MUELL. Synops. i, 571 (1849). WILS. Bry. brit. 111, t. 41 (1855). SCHIMP. Synops. 151 (1860), 2 ed. 171. BERK. Handb. br. m. 261 (1863). MILDE Bry. siles. 104 (1869). HUSN. Mouss. nord-ouest 74 (1873), Musc. gall. 88, t. 25 (1885). HOBK. Syn. br. m. 61 (1873). JURATZ. Laubm. oesterr.-ung. 103 (1882). LESQ. JAMES Mosses N. Amer. 109 (1884).

Didymodon crispulus WILS. HOOK. Br. fl. ii, 30 (1833), Eng. Bot. Suppl. t. 2734 (1834). MACK. Fl. hibern. P. 2, 18 (1836).

Plaubelia tortuosa (non BRID.) BRUCH MSS.

Mollia crispula LINDB. Musc. scand. 21 (1879).

Dioicous; densely cæspitose, fastigiate, bright green. Comal leaves patulous, when dry with involute wings, incurved cirrhate, lineal, margin erect, subundulate, cucullato-incurved at apex, concave, very minutely papillose, upper cells small, indistinct, basal narrowly rectangular, nerve terete shortly excurrent in a mucro. Perich. bracts 2—3 semivaginant, with an erect lanc. acute apex; seta red below, yellowish above, caps. erect, ovate or elliptic, irregularly sulcate when dry and empty, lid long-beaked, red at margin, teeth in two unequal legs, more or less perfect, finely papillose.

Male plants like the female or nearly simple, bracts ovate acuminate.

HAB.—Rocks, walls and banks in calcareous districts, particularly near the sea; not common. Fr. 5—6.

Ormeshead and Tros-y-Marian, Anglesey (*Wilson* 1829)! Frequent in Sussex (*Mitten*). St. Vincent's rocks and Leigh woods (*Thwaites* 1844)! Cliff at Scalby mill, Yorks. (*Spruce* 1843)! Common about Plymouth (*Holmes* 1868)!! Torquay (*Dickie*). Arthur's seat (*Hunt* 1864)! Shere, Surrey (*Dr. Capron* 1869)! Buckfastleigh and Swanage (*Holmes*)!! Folkestone, Kent (*Holmes*)!! Muckross, Dunkerron and Benbulben, Ireland (*Moore*)!! Rushen Abbey, I. of Man (*Holt* 1884)!! Great Doward hill, Monmouth (*Boswell* 1875)!! Falmouth and St. Ouens, Jersey (*Holmes.*) Monsal Dale (*Holt* 1882)!!

Var. *β.* **viridula** (*Bruch*).

Plants smaller, bright yellow-green; leaves longer, lanceolate, gradually narrowed upward, acuminate; fruit smaller.

SYN.—*Trichostomum viridulum* BRUCH in Flora xii, P. II, 401, t. 2, f. 5. HUEBEN. Musc. germ. 303.

T. trifarium HARTM. Skand. fl. 7 ed. 381.

T. planum LINDB. in Oefv. vet. ak. foer. xvi, 210. HARTM. op. c. 8 ed. 396.

T. crispulum Var. *angustifolium* et *longifolium* SCHIMP. Synops.

HAB.—Cliffs at Babbicombe, Devon (*Davies* 1866)!! Vale of Llanthony (*Boswell* 1871)!!

Var. γ. **elata** *Schimp.*

Tall, in large tufts, deep green above, fuscescent below, 2 in. high; leaves longer, more solid, muticous.

SYN.—*Trichostomum crispulum* Var. ε. *elatum* Schimp. Synops. 2 ed. 172.

HAB.—Muckross and Cromaglown (*Hunt* 1864)!! Cheddar Cliffs (*Boswell* 1873)!! Ingleton, Yorks (*West* 1882)!! Barmouth (*Holt* 1882)!! Rathlin Is., Ireland (*Stewart* 1882)!!

Var. δ. **nigro-viridis** *Braithw.*

Plants tall, very slender, in very dense cushioned tufts, deep green above, black below; stems repeatedly dichotomous; leaves small, shorter, more patent, with smaller areolation, the margins incurved above, upper cells papillose at back.

HAB.—Near the summit of Ingleboro (*Nowell* 1857)!!

This moss is most variable and presents forms which offer the greatest difficulty in assigning them a place under this species or *M. brachydontia;* the typical form is definite enough, for the nerve apex being curved up and then excurrent from the lamina as a short mucro, gives the leafpoint a mimic resemblance to the bow of a boat, but in the var. *viridulum* this is so tapered off as frequently to become indefinite, and we have then only to rely on the general obtuseness and incurved edges of the leaf-apex. Lindberg is of opinion that the var. β. is *Didymodon trifarius* SWARTZ.

15. MOLLIA LITORALIS (*Mitt.*) *Braithw.*

Dioicous; densely cæspitose. Leaves oblong-ligulate, obtuse, mucronate with the excurrent nerve. Caps. oblong; lid conico, rostrate. (T. XXXV, E.)

SYN.—*Trichostomum litorale* MITT. in SEEM. Journ. Bot. 1868, p. 99, t. 77, fig. 7—9, HOBK. Syn. br. m. 61 (1873). HUSNOT Mouss. nord-ouest 74 (1873), Musc. gall. 88. t. 25 (1885). SCHIMP. Synops. 2 ed. 180 (1876).

Dioicous; densely cæspitose, dull yellow green above, brown at base. Stems ¼—1½ in. high, simple or innovating, interrupted and comose. Leaves short erecto-patent, slightly recurved in the upper half, when dry incumbent and arcuato-incurved, oblongo-ligulate, obtuse, channelled; nerve yellowish, stout, excurrent in a short mucro; cells at base oblongo-rectang. pellucid, above rounded and obscure, minutely papillose. Capsule on a short pale yellow seta, oblong, tapering at base, fuscescent, with a red mouth, lid yellow, conico-rostellate; peristome pale, the teeth rather short, with two slender nearly equal legs.

HAB.—Sea-coast in the S. and West of England. Fr. 3—4.

Sandy ground below the cliffs east of Hastings (*Mitten*). Whitsand bay (*Brent*). Aldrington beach, Sussex (*Davies* 1864)!! Staddon heights, Plymouth, Devonport and Newquay (*Holmes* 1868)!! Badger's cross, Penzance c. fr. (*Curnow* 1867)!! St. Minver, Cornwall (*Tellam* 1871)!! Penmon, Anglesey (*Boswell* 1874)!! Tigh-na-bruaich on the Clyde (*Dr. Stirton* 1864, named by Wilson *T. mutabile* Var. *brevifolium*)! Between Loch Ness and Loch Oich, a very tall form (*Hunt* 1866)!! Rannoch (*Dr. B. White* 1867)! Douglas, Gobey valley and sandy cliffs at Peel, I. of Man (*Holt* 1884)!! Carlingford Mtn., Ireland (*Rev. C. Waddell* 1883)!! Barmouth (*Holt* 1882)!!

Var. β. **angustifolia** *Lindb. in litt.*

Stem more slender, with laxer, more patent, narrower linear leaves.

HAB.—Cromaglown, Killarney (*Lindberg*, 1873) ! !

This moss is almost exactly intermediate between *M. crispula* and *brachydontia*, and some of the varieties of these species so nearly connect the two, that it is rather difficult to define the present one. The most important character is derived from the form of the leaf, this is short and almost lineal in outline on the main axis, but on the innovations broader towards the point as in some Pottias, the apex ends somewhat as in *crispula*, but the nerve does not curve up, but runs straight out in an acute triangular mucro as in *flavo-virens*, while the margins do not roll inward, but are plane, in which, as well as in the areolation it agrees best with *brachydontia*. The stem varies greatly in size and branching, lateral innovations being very frequent, the leaves of which on the lower part are very small and distant, suddenly becoming accrescent upward into a coma.

Prof. Lindberg also sends *M. litoralis* from Dingle, Howth, and O'Sullivan's cascade, and the male plant from Cromaglown; the latter is in lax tufts, 1 inch high, the male infl. minute, gemmiform, in the axils of the comal leaves, the bracts 4—5, ovate acuminate, laxly areolate, nerved to apex.

16. MOLLIA BRACHYDONTIA (*Bruch*) *Lindb.*

Dioicous; cæspitose. Leaves broadly lanceolate, gradually acuminate, cuspidate with the flat straight excurrent nerve. Caps. ovate, lid conic, rostrate, teeth of peristome very short and irregular. (T. XXXVI, A.)

SYN.—*Trichostomum brachydontium* BRUCH in Flora xii, P. II, 393, t. 1, f. 3 (1829). LINDB. de Tort. 228 (1864). HOBK. Syn. br. m. 60 (1873).

Didymodon brachydontius WILS. in HOOK. Br. Fl. ii, 30 (1833), Eng. Bot. Suppl. t. 2735 (1834). MACK. Fl. hib. P. II, 18 (1836).

Trichostomum mutabile BRUCH MSS. DE NOT. Syllab. 192 (1838), Epil. bri. ital. 504 (1869). BR. SCH. Bry. eur. fasc. 18—20, Mon. 8, t. 5 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 114 (1848). C. MUELL. Synops. i, 571 (1849). WILS. Bry. brit. 112, t. 41 (1855). SCHIMP. Synops. 150 (1860), 2 ed. 170. BERK. Handb. br. m. 261 (1863). MILDE Bry. siles. 103 (1869). HUSN. Mouss. nord-ouest 74 (1873), Musc. gall. 87, t. 25 (1885). JURATZ. Laubm. oesterr.-ung. 103 (1882).

Tortula brachydontia, MITT. Journ. Linn. soc. Bot. xii, 148 (1869).

Mollia brachydontia LINDB. Musc. scand. 21 (1879).

Dioicous; densely cæspitose, ½—2 in. high, dull yellow-green above, fuscous below. Leaves firm and twisting when dry, erecto-patent when moist, lower minute, upper comant, elongato-lanceolate, acuminate, the nerve flattish, stout, yellowish, excurrent in a flat straight acute point; margin subundulate, erect, cells at base small, rectangular, pellucid, above very minute, hexagonal, opake. Perich. bracts narrower, linear, longly acuminate; caps. on a longish slender purple seta, erect, ovate,

elliptic or subcylindric, fuscous, lid conico-rostrate, teeth of per. pale yellow, short, unequal and variable, papillose. Male plant smaller, bracts ovato-acuminate, laxly areolate at base.

HAB.—Calcareous rocks, especially on the coast. Fr. 4—6.

Ormeshead and Carrig Onnen and Tros-y-Marian, Anglesey (*Wilson* 1828)!! Gap of Dunloe (*Wilson* 1829)!! Near Bantry (*Miss Hutchins* 1809)! Dunkerron, Kerry and Kenmare (*Taylor* 1833). Aber (*Hunt* 1865)!! Milnthorpe (*Barnes* 1868)!! Bangor (*Wilson* 1856)! Leigh woods, Bristol (*Wilson* 1860)!! Cliffs at Newhaven (*Hemmings* 1855)! Gordale (*Nowell* 1854)!! Minehead, Somerset (*Miss Gifford* 1868)!! Elburton and Knighton, Plymouth (*Holmes* 1871)!! Loch Ness (*Hunt*)! Dolgelly (*Tetlow* 1880)!! Ingleton (*West* 1882)!! Spanish head and Douglas, I. of Man (*Holt* 1884)!! Dovedale (*Wilson* 1867)! Penzance (*Curnow*)!!

Var. *β.* **cophocarpa** (*Schimp.*)

Plants more slender, tall, bright green above, rufescent below; leaves lanceolate below, longer, acutely acuminate; caps. on a shorter pedicel, oval, brown, peristome very rudimentary.

SYN.—*T. mutabile* Var. *δ. cophocarpum* SCHIMP. Synops. 2 ed. 171.

HAB.—Chee-dale, Derby, c. fr. (*Whitehead* 1880)!! Miller's dale (*West* 1881)!! Clydach Valley, near Abergavenny (*Mitten* 1883)!!

This is indeed a variable moss, as one of its names implies, and no doubt the last species has often been confounded with it. The excurrent nerve varies in the length of the point, but there is always a certain tapering upward of the lamina, this, with the minute opake areolation and plane margins, best distinguish it. Mr. Mitten distributed specimens of the Var. *β.* as *Barbula paludosa* SCHWAEGR. (1811)=*Tortula crocea* BRID. (1806), but it does not belong to that species, for although having much external resemblance to it, it may be noted that *Barbula crocea* has shorter, straighter and more erect leaves, suddenly pointed, the nerve only forming a short apiculus, the areolation of the upper part is also smaller and more indistinct, and the margin towards the apex has several irregular teeth.

17. MOLLIA LUTESCENS *Lindb.*

Dioicous; resembling *M. brachydontia*, but with longer ligulate leaves, aristate with the terete excurrent nerve, the cells all pellucid and pulvinate. (T. XXXVIII, C.)

SYN.—*Mollia lutescens* LINDB. MSS.

Dioicous; in small lax incoherent tufts, yellowish green above, rufescent below. Leaves accrescent upward, erecto-patent when moist, crispate when dry, very long, narrow and ligulate, scarcely concave, suddenly pointed and aristate with the excurrent nerve; basal cells narrowly rectangular, pellucid, upper all pellucid, very distinct and with chlorophyl, not papillose, but pulvinate in outline.

HAB.—Fissures of limestone rocks at Glena, Killarney, ♀ ster. (*Lindberg*, July, 1873) ! !

Although so close to *M. brachydontia*, this appears to be a good species, being a coarser fragile plant with the cells in the upper part of leaf much better defined.

Sect. 3. TORTELLA. *C. Muell.* Plants taller, robust, dense-leaved throughout. Leaves long, carinate, cirrhato—crispate when dry, the sheathing base thin, white, and hyaline. Peristome sometimes twisted.

18. **MOLLIA TENUIROSTRIS** (*Hook. Tayl.*) *Lindb.*

Dioicous; in lax soft bright green tufts. Leaves long, cirrhate, flexuoso-patulous, linear-lanceolate, subundulate, nerve ending in the apex. Caps. narrow, cylindric, lid conico-rostrate, teeth linear-lanceolate. (T. XXXVI, B.)

SYN.—*Weissia tenuirostris* HOOK. TAYL. Musc. brit. 2 ed. 83, suppl. t. 3 (1827). HOOK. Br. fl. ii, 21 (1833). MACK. Fl. hibern. P. II, 14 (1836).

Weissia cylindrica BRUCH MSS. BRID. Bry. univ. i, Suppl. 806 (1827). NEES HORNSCH. Bry. germ. ii, P. II, 58, t. 29, f. 13 (1831). DE NOT. Syllab. 232 (1838).

Weissia cirrata β. cylindrica HUEBEN, Musc. germ. 127 (1833).

Didymodon tenuirostris WILS. in HOOK. Bot. J. iii, 378 (1841). HUSN. Musc. gall. 80, t. 22 (1885).

Didymodon cylindricus (non WAHLENB.) BR. SCH. Bry. eur. fasc. 29—30. mon. 5, t. 3 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 102 (1848). WILS Bry. brit. 108, t. 33 (1855). SCHIMP. Synops. 132 (1860), 2 ed. 164. BERK. Handb. br. m. 265 (1863). DE NOT. Epil. bri. ital. 563 (1869). HOBK. Syn. br. m. 59 (1873). HUSN. Mouss. nord-ouest. 69 (1873). LESQ. JAMES Mosses N. Amer. 105 (1884).

Trichostomum cylindricum (non HEDW.). C. MUELL. Synops. i, 586 (1849). MILDE Bry. siles. 100 (1869). JURATZ. Laubm. oesterr.-ung. 104 (1882).

Tortula cylindrica MITT. Journ. Linn. soc. i, suppl. 28 (1859).

Trichostomum tenuirostre LINDB. De Tort. 225 (1864).

Tortula tenuirostris MITT. Journ. Linn. soc. Bot. xii, 148 (1869).

Mollia tenuirostris LINDB. Musc. scand. 21 (1879).

Dioicous; in flat, lax, soft tufts, yellow green or sometimes dark lurid green above, rufescent or fuscous at base. Stems ½—2 in. high, flexuose, bifid or trifid by innovation. Leaves rather lax below, becoming more crowded, longer and comant upward, very long from an erect base, flexuoso-patulous, when dry strongly twisting and cirrhate, linear-lanceolate, channelled, undulate, wings fragile, strongly verruculose, margin minutely crenulate, occasionally with a few remote teeth at apex, cells at base lax pellucid, gradually and equally becoming oblong and oval, above roundish-quadrate, opake; nerve terete, narrow, prolonged into the apex. Perich. bracts with a longer sheathing base; caps. on a slender reddish-yellow seta, erect, leptodermous, narrowly cylindric, pale brown; lid pale red, conico-rostrate,

half-length of caps. acute, annulus of two rows of narrow cells; teeth pale red, narrowly lineal-lanceolate, cleft, or perforated, the legs closely cohering. Male plant more slender, repeatedly branched, bracts from an ovate concave base, narrowly lineal-lanceolate.

HAB.—Damp shady rocks and by waterfalls, sometimes on trunks of trees; not uncommon, but rare in fruit. Fr. 10.

Dolgelly, Dennant and Conway c. fr. (*Wilson* 1830)!! Lythebeck, Eskdale (*Spruce* 1842)! Crambeck and Howley Wood, Castle Howard (*Spruce* 1844)! On trees, Stapleton, Bristol (*Thwaites* 1843)! Powerscourt and Killarney (*Taylor*). Brandon Mountain (*Moore*). Glen Roy and foot of Ben Voirlich c. fr. Torc cascade, Eagle's nest and Cromaglown (*Hunt* 1867)!! Dunoon and Trossachs (*Hunt* 1866)! Cwm Bychan and Tyn-y-Groes (*Holt* 1882)!! Pigeon rock Mtn., Mourne Mtns., Co. Down (*Rev. H. Lett and C. Waddell* 1885)!! Barmouth (*Whitehead*)!!

Var. β. **Daldinii** (*De Not.*)

In wider tufts of a yellow-green colour; leaves shorter, broader, gradually narrowed towards apex, or suddenly apiculate, very acute, two marginal series of cells pachydermous, yellow; capsule small oblong.

SYN.—*Didymodon cylindricus* Var. β. *Daldinianus* DE NOT. Epil. I. c. SCHIMP. Synops. 2 ed. 165.

HAB.—In more Alpine localities.

Ben Voirlich (*McKinlay* 1862). Ben More and Ben Lawers (*Hunt* 1865)!! Trossachs (*Hunt* 1866)! Borrowdale (*Wilson* 1864). Ben Arthur (*Stirton* 1864). Twll Du, Caernarvon (*Holmes* 1876)!! Moy Laggan, Perth (*Mrs. Farquharson* 1879)!! Tyn-y-Groes, Wales (*Holt* 1885)!!

Var. γ. **Holtii** *Braithw.*

Plants robust, densely matted and tomentose, with stout straight stems dark green above, black below; leaves more dense, the upper often slightly secund, erecto-patent, firm, apex rather obtuse, the nerve lost at point, cells smaller, dense, nearly smooth.

HAB.—Dripping rocks and in the spray of waterfalls.

Bamford wood, Lancashire (*Holt* 1883)!! Injebreck and Sulby glen, I. of Man (*Holt* 1883)!! Clogwyn-du-Arrddu and Tyn-y-groes, Wales (*Holt* 1883)!! Cromaglown and O'Sullivan's cascade (*Stewart and Holt* 1885)!!

Much resembling *M. tortuosa*, but more slender, and readily distinguished from it by the basal areolation, which in the latter is sharply defined from the chlorophyllose in a direction running obliquely upward and outward. It varies much in size, and when exposed to dripping water becomes dark green and often much elongated.

Schimper's Var. **robustus**, from Troutbeck, is only *M. tortuosa*.

19. MOLLIA HIBERNICA (*Mitt.*) *Lindb.*

Dioicous; tall and branching. Leaves from an ovate clasping base which is dilated upward, lanceolate-subulate, patent, entire, nerved to apex, basal cells elongate rectangular, abruptly passing to minute rounded chlorophyllose ones. (T. XXXVI, C.)

SYN.—*Anœctangium Hornschuchianum* (non HOPPE HSCH.) WILS. Bry. brit. 312 (1855).

Tortula hibernica MITT. in SEEM. J. Bot. 1867, p. 329. BRAITHW. in Journ. Bot. 1871, p. 294, T. 120, f. 5. HOBK. Syn. br. m. 72 (1873).

Didymodon controversus WILS. MSS.

Barbula cirrifolia SCHIMP. Synops. 2 ed. 219 (1876).

Dioicous; in lax tufts, yellow-green above, rufescent below, tall, 2—4 in. high, branched, not radiculose. Leaves lax below, becoming longer and comose above, from an erect base, flexuoso-patulous when moist, cirrato-crispate when dry, at the base becoming wider upward, oval-oblong, concave and semi-amplexicaul, then longly lanceolate-subulate and concave, the margin slightly undulate at base, erect and entire above, very minutely verruculose; nerve yellowish, continued to the apex, smooth at back, cells of the dilated base pellucid, rectangular, hyaline, suddenly joining the small quadrate chlorophyllose ones which form the rest of the leaf. Perich. bracts more longly sheathing, flexuose and curved in the upper part. Calyptra narrow, deeply cleft, convolute below; caps. equal, cylindric. Male infl. in the stellate coma, bracts oblong and concave at base, shortly subulate; antheridia very numerous.

HAB.—Wet rocks at Cromaglown, Killarney (*Taylor*)!! Brandon Mtn., Kerry (*Moore* 1862)!!

This fine moss is very close to *M. tenuirostris*, but is readily distinguished by the dilated base of the leaf and very different areolation. The fruit was unknown until Schimper detected one or two old capsules, which had lost their peristomes, and fig. 5 and 6 are copied from his drawings.

20. **MOLLIA FLAVOVIRENS** (*Bruch*) *Lindb.*

Dioicous; soft, cæspitose. Leaves from a sheathing oblong glossy white base, lineal, undulate, very concave, nerve excurrent in a short mucro. Caps. erect, oblongo-cylindric, lid conic rostrate, teeth long, filiform. (T. XXXVI, D.)

SYN.—*Trichostomum flavovirens* BRUCH in Flora, xii, P. II, 404, t. 2, fig. 7 (1829). DE NOT. Syllab. 193 (1838), Epil. bri. ital. 502 (1869). BR. SCH. Bry. eur. fasc. 18—20, p. 6, t. 2 (1843). RABENH. Deutsch. kr. fl. ii, S. 3, 113 (1848). C. MUELL. Synops. i, 585 (1849). SCHIMP. Synops. 152 (1860), 2 ed. 174. MITT. in SEEM. J. Bot. 1868, p. 97, t. 77, f. 1—4. MILDE Bry. siles. 105 (1869). HOBK. Syn. br. m. 61 (1873). HUSN. Mouss. nord-ouest 74 (1873), Musc. gall. 86, t. 24 (1885). JURATZ. Laubm. oesterr.-ung. 106 (1882). LESQ. JAMES Mosses N. Amer. 109 (1884).

Didymodon tricolor BALS. DE NOT. in Mem. acc. Torin. xl, 333 (1838).

Tortula flavovirens LINDB. de Tort 252 (1864).

Mollia flavovirens LINDB. Musc. scand. 21 (1879).

Dioicous; laxly cæspitose, sparingly branched, in soft dull yellow-green tufts, ½—1 inch high, fuscous or pale at base and tomentose. Lower leaves very small, remote, suberect, upper longer, crowded in a

patulous coma, from a longly sheathing oblong glossy whitish thin base, lineal-lanceolate, yellow-green or somewhat glaucous, when dry arcuato-incurved, the wings more or less undulated, very concave, nerve stout, terete, excurrent in a short mucro ; cells at base hyaline, small elongated rectangular, slanting upward from the nerve to the margin, suddenly joined by the oval chlorophyllose cells, which become rounded subquadrate toward apex. Perich. bracts similar, but a little more elongated, caps. erect on a subflexuose seta which is yellowish above, purple at base, leptodermous, oblong and oblongo-cylindraceous, pale yellow-brown with a red mouth, lightly sulcate when dry ; lid conic-rostrate, not annulate, teeth long filiform, equal, purple, on a narrow basal membrane, erect or slightly twisted. Male plant simple or divided, bracts ovate, acuminate.

HAB.—Sandy ground near the coast ; S. of England, not common and always sterile. Fr. 5.

Shoreham beach and Seaford (*Borrer* 1837)! Ditten marsh (*Wilson* 1859). Howth, Portmarnock sands, Dublin and Arklow (*Moore* 1859)!! Malahide and Ross Bay (*Carrington* 1861)! Below Staddon heights, Plymouth (*Holmes* 1867)!! Below Menai declivity (*Hunt* 1868)! St. Minver, Cornwall (*Tellam* 1871)! Hayle sands and Newlyn cliff (*Curnow* 1872)!! Dingle bay (*Lindberg* 1873)!! Wembury and Dartmouth (*Holmes* 1883)!! Mawgar Porth, Cornwall (*Holmes* 1884)!! Southport (*Burgess* and *Holt* 1885)!! Rabbit warren, St. Anne's on the sea (*Cash* 1884)!! Largo Links (*Howie*)!!

Readily known by its soft texture and interruptedly comose leaves, with their obliquely ascending basal cells ; in habit it comes nearest *M. humilis* (HEDW.), and the leaf also resembles that of *M. inclinata* so closely that it is sometimes very difficult to decide between barren specimens.

21. MOLLIA NITIDA *Lindb.*

Dioicous ; compactly tufted. Leaves linear-lanceolate, acute, the apex generally broken off, circinato-incurved when dry, paler and shining on the back, mucronate with the excurrent nerve. Caps. cylindric, teeth small and imperfect. (T. XXXVII, A.)

SYN.—*Tortula nitida* LINDB. de Tort. 252 (1864), Hedwigia iv, 40 (1865), Journ. Linn. soc. Bot. xi, 464 (1871). BRAITHW. Journ. Bot. 1871, p. 294. HOBK. Syn. br. m. 73 (1873).

Barbula Alexandrina LOR. in Abhand. ak. wiss. Berl. 1867, pp. 32—35, t. 6—7.

Trichostomum diffractum MITT. in SEEM. Journ. Bot. 1868, p. 98, t. 77, f. 5—6.

Trichostomum Barbula (non SCHWAEG.) LANGE in Bot. Tids. ii, 235 (1868).

Barbula nitida GRAVET in Rev. bryol. 1874, p. 19. JURATZ. Laubm. oesterr.-ung. 121 (1882).

Trichostomum nitidum SCHIMP. Synops. 2 ed. 179 (1876). PHILIB. in Rev. bryol. 1878, p. 27. et 1883, p. 77. HUSNOT Musc. gall. 87, t. 24 (1885).

Dioicous; in small dense pulvinate tufts, olivaceous-green or yellowish-green above, rufo-fuscous or blackish at base, stems robust, dichotomous, dense-leaved, tomentose below. Leaves gradually

accrescent upward, very fragile and breaking off in the upper part, from a short erect base, patent when moist, arcuato-incurved when dry, the wings inflexo-complicate, glossy and shining on the back, lineal-lanceolate, at apex more or less longly acuminate, or suddenly almost apiculate, concave, the margin plane and subundulate, finely crenulate with projecting cells, base subvaginant, with lax elongated hyaline cells, which are small and run upward and outward to the margin, the other cells very minute, rounded quadrate, green, papillose on both sides; nerve stout, pale green, finally brownish, prominent on the back, excurrent in a short mucro. Perich. bracts small, lanceolate-subulate, with excurrent nerve, seta purple at base, passing to yellow above, caps. oblongo-cylindric, pale brown with a red mouth, faintly sulcate when old, annulus indistinct, lid ⅓ length of caps. obliquely rostrate, pale red, teeth of per. very short and irregular, truncate, yellow, papillose. Male infl. minute, gemmiform, in the axils of the upper leaves; bracts 3 or 4, broad, oblong, with a narrow ligulate upper half, nerve vanishing.

HAB.—Calcareous rocks and walls.

Carnelly and St. Michael's chapel, Torquay (*Borrer*). St. Vincent's rocks and Durdham downs (*Thwaites* 1843) ! ! Greenaleigh, Minehead (*Miss Gifford* 1868) ! ! Penzance (*Curnow*) ! ! I. of Purbeck, Plymouth and Corfe castle (*Holmes* 1865) ! ! Lynmouth, Durlestone head and Peveril point, Swanage (*Holmes* 1883) ! ! Dovedale at the opening of Halldale (*Holmes* 1875) ! ! Grange and Arnside (*Boswell* 1873) ! ! Cheddar (*Boswell* 1873) ! ! Mendip hills (*Boswell* 1880) ! ! Shaugh bridge, Devon (*Holmes* 1884). Colvend, Scotland (*Cash* and *McAndrew* 1883) ! ! Ruins at Innisfallen (*Stewart* and *Holt* 1885) ! ! O'Donoghue's Prison, Lough Leane ♂ (*Holt* 1885) ! ! Mouse island, Killarney (*Holt* 1885). Whitbarrow, Westmoreland (*Barnes* 1871) ! !

Leaves longer and broader than in *M. brachydontia*, all circularly arcuato-incurved when dry, and glossy at the back. The fruit has only been found at Angoulême, in France, by M. Philibert in 1867, for some of whose specimens I am indebted to the kindness of M. Husnot. Some botanists have been disposed to refer this moss to *Mollia tortuosa*, but they are quite distinct, and the glossy stiff little cushions of *M. nitida* have an aspect so peculiar that it may always be identified by the naked eye alone.

22. **MOLLIA INCLINATA** (*Hedw. fil.*) *Lindb.*

Dioicous; densely tufted. Leaves elongate, lineal, undulate, suddenly pointed, mucronate with the excurrent nerve. Caps. oval-oblong, cernuous; peristome twisted. (T. XXXVII, B.)

SYN.—*Barbula nervosa* BRID. Musc. rec. II, P. I, 199 p.p. (1798), Mant. 95 p.p. t. 19 (1819).

Tortula inclinata HEDW. FIL. in WEB. MOHR Beitr. i, 123, t. 5 (1805). HOOK. GREV. in BREWST. Edin. J. i, 298 (1824). DE NOT, in Mem. acc. Torin. xl, 322 (1838), Syllab. 181 (1838), Musc. ital. I, 65, t. 33 (1862), Epil. bri. ital. 558 (1869). LINDB. De Tort. 252 (1864). HOBK. Syn. br. m. 2 ed. (1884). BOSW. Journ. Bot. 1874, p. 1, t. 139.

Tortula nervosa BRID. Sp. musc. I, 262 p.p. (1806).

Tortula curvata SCHLEICH. Cat. pl. helv. 30 (1807).

Barbula inclinata SCHWAEG. Suppl. I, P. I, 131, t. 33 (1811). ROEHL. Deutsch. fl. iii, 80 (1813). SCHULTZ Recens. Barb. et Syntr. 218, t. 33, f. 27 (1823). BRID. Bry. univ. i, 575 (1826). HUEBEN. musc. germ. 332 (1833). BR. SCHIMP. Bry. eur. fasc. 13—15, p. 25, t. 12 (1842). RABENH. Deutsch. kr. fl. ii, s. 3, 107 (1848). C. MUELL. Synops. i, 600 (1849). SCHIMP. Synops. 178 (1860), 2 ed. 217. MILDE Bry. siles. 123 (1869). HUSN. Mouss. nord-ouest 83 (1873). JURATZ. Laubm. oesterr.-ung. 121 (1882).

Mollia tortuosa Var. *β. inclinata* LINDB. Musc. scand. 21 (1879).

Dioicous; in large broad tufts, flat, dense, dull yellowish green above, fuscous at base. Stems robust, ½—1 inch high, dense-leaved, fragile. Leaves erect, acute, nearly straight, lineal-lanceolate, complicate and cirrato-crisped when dry, the wings somewhat undulate, the nerve whitish at back, excurrent in a very short mucro; basal cells hyaline very narrow, running obliquely upward and outward, upper small, roundish-quadrate, papillose, opaque. Perich. bracts erect, longer, narrower, acuminate, more laxly areolate; seta red, flexuose, caps. cernuous, oval-oblong, more or less incurved and gibbous at base, castaneous; lid rufous, narrowly conic, rostrate, peristome fugacious, of two spirals. Male infl. terminal, gemmiform, bracts ovate, pointed, nerved.

HAB.—Sandy banks and heaths, especially by the sea; sterile.

Holton stone-pits, Oxford (*Boswell* 1872) ! ! Banks by the sea, Groomsport, Co. Down (*Rev. C. H. Waddell*, 1885) ! ! Dysart, Forfar (*Ewing* 1883) ! !

Resembling a small state of *M. tortuosa*, but differing by the shorter, broader, lineal-lanceolate leaves, more suddenly pointed, and with the margins at the point more or less incurved; the capsule also is generally more gibbous than that of *M. tortuosa*. The leaf resembles that of *M. flavovirens* very closely in areolation, but may be distinguished from it by being cirrato-crisped when dry.

23. MOLLIA TORTUOSA (*L.*) *Schrank.*

Dioicous; in large pulvinate tufts. Leaves dense, strongly curled, longly lineal-lanceolate, subulate, undulate, nerve excurrent. Caps. oblongo-cylindric, peristome contorted. (T. XXXVII, C.)

SYN.—*Bryum trichoides longifolium, crassiusculis cauliculis, capitulis erectis aduncis acutis* DILL. in RAY Synops. 3 ed. 98 (1724).

Bryum cirratum, setis et capsulis longioribus DILL. Hist. musc. 377, t. 48, fig. 40 A—D (1741) et Herbar.

Bryum tortuosum L. Sp. plant. ii, 1119, (1753). HUDS. Fl. angl. 408 (1762). NECK. Meth. musc. 227 (1771). WITH. Bot. arr. br. veg. ii, 675 (1776). LIGHTF. Fl. scot. ii, 727 (1777). EHRH. Hann. mag. 1780, p. 236. RELHAN Fl. cant. suppl. 18 (1786). Fl. danica t. 888. HULL Br. Fl. P. 2, 255 (1799). HOFFM. Deutsch. fl. ii, 46 (1795).

Hypnum tortuosum WEB. Spic. fl. goett. 90 (1778).

Mnium tortuosum SWARTZ Meth. Musc. 27 (1781).

Mollia tortuosa SCHRANK Baiers. fl. ii, 458 (1789). Pr. fl. salisb. n. 833 (1792). LINDB. Musc. scand. 21 (1879).

Tortula tortuosa EHRH. Beitr. vii. 101 (1792). SCHRAD. Spic. fl. germ. 64 (1794). BRID. Musc. rec. II, P. I, 189 (1798), Sp. musc. I, 264 (1806). SWARTZ Musc. suec. 39 (1798). ROEHL. Moosg. deutsch. 391 (1800). ROTH Fl. germ. iii, P. I, 202 (1800). HEDW. Sp. musc. 124 (1801). RICH. Fl. amer. bor. ii, 295 (1803). SMITH Fl. brit. iii, 1258 (1806); Eng. bot. t. 1708. TURN. Musc. hib. 52 (1804). HEDW. FIL. in WEB. MOHR Beytr. i, 121, t. 6 (1805). P. BEAUV. Prodr. 93 (1805). WAHLEN. Fl. lapp. 317 (1812); Fl. carpat. 358 (1814). HOOK. TAYL. Musc. brit. 32, t. 12 (1818). GRAY Nat. arr. br. pl. i, 724 (1821). HOOK. Br. fl. ii, 46 (1833). DE NOT. in Mem. acc. Torin. xl, 322 (1838), Syllab. 182 (1838), Musc. ital. I, 66, t. 39 (1862), Epil. bri. ital. 556 (1869). WILS. Bry. brit. 125, t. 12 (1855). BERK. Handb. br. m. 255 (1863). LINDB. de Tort. 253 (1864). HOBK. Syn. Br. m. 72 (1873).

Barbula tortuosa WEB. MOHR Bot. Tasch. 205 (1807). SCHWAEG. Suppl. I, P. I, 129, t. 33 (1811). VOIT Musc. herb. 53 (1812). ROEHL. Deutsch. fl. iii, 80 (1813). MART. Fl. cr. erl. 88 (1817). BRID. Mant. musc. 95 (1819), Bry. univ. i, 574 (1826). FUNCK Moost. 23, t. 15 (1821). SCHULTZ Recens. Barb. et Syntr. 219, t. 34, f. 28 (1823). HUEBEN. Musc. germ. 333 (1833). BR. SCHIMP. Bry. eur. fasc. 13—15, p. 26, t. 13 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 107 (1848). C. MUELL. Synops. i, 601 (1849). SCHIMP. Synops. 179 (1860), 2 ed. 218. MILDE Bry. siles. 123 (1869). HUSN. Mouss. nord-ouest 84 (1873). JURATZ. Laubm. oesterr-ung. 122 (1882). LESQ. JAMES Mosses N. Amer. 129 (1884).

Dioicous; in large soft swollen pulvinate tufts, fine yellow-green above, fuscous below. Stems tall 1—4 in. high, dichotomous fastigiate, tomentoso-radiculose at base. Leaves densely crowded, flexuoso-patent when moist, circinato-crispate when dry, from a thin pale ovate base, longly lineal-lanceolate subulate, undulate, nerve strong, excurrent in a short subdenticulate point; upper cells minute, obscure, basal hyaline narrow and elongated, running obliquely upward and outward to the margin. Perich. bracts erect, semivaginant, narrowly acuminate, whitish; caps. on an elongated red seta, erect, from ovate oblongo-cylindric, subregular or more or less arcuate, leptodermous, at first greenish-yellow, afterwards pale brown, when old dark brown; lid elongato-conic, subulate, as long as caps. or shorter, not annulate, peristome red, very slender, scabrous, several times convolute. Male plant smaller, with shorter lanceolate leaves, infl. terminal, bracts ovate, concave, suddenly lanceolate, nerved.

HAB.—Rocks, especially calcareous, but also on sandstone and on banks and walls. Fr. 7.

Var. *β.* **dicranoidea** *Ferg.* MSS.

Stems tall, compactly tufted 3—6 in. high, densely radiculose nearly to the apex; leaves subsecund, firm, rigid, the terminal collected into a cuspidate tuft.

HAB.—M. Uam, Glen Shee, &c. (*Fergusson* 1879)!!

Var. *γ.* **angustifolia** (*Juratz.*)

Plants shorter, more slender, glaucescent; leaves from a longish base, very narrowly lanceolate-subulate, the hyaline cells extending far up the basal margin.

SYN.—*Barbula tortuosa* Var. *β. angustifolia* JURATZ. Laubm. oesterr.-ung. 123.

HAB.—Winnatts, Derby (*T. Rogers* 1881)!! Wall west of Bryanford, Co. Down (*Rev. H. W. Lett* 1885)!!

Var. δ. **fragilifolia** (*Juratz.*)

Plants short, ½ in. high, yellow-green, with few radicles; leaves short, incurved, fragile, and breaking off near the summit, so that the apical only are entire, points short, not acuminate, mucronate with the excurrent rufescent nerve, which is pale and glossy at the back.

SYN.—*Barbula tortuosa* Var. γ *fragilifolia* JURATZ. l. c.
Tortula thrausta STIRTON MSS.

HAB.—On a wall near Killin (*Stirton* 1868).

This fine moss varies considerably in size and colour, and is very shy of fruiting, but may be always recognised by its long narrow curled leaves, with thin hyaline cells at the base. The var. δ. has much resemblance to *M. nitida* in the fragile leaves, but their soft texture and yellow-green colour sufficiently distinguish it.

24. **MOLLIA FRAGILIS** (*Drumm.*) *Lindb.*

Dioicous; in dense tufts. Leaves dense, straight, erecto-patent, lanceolate-subulate, breaking off at the points, margin plane, nerve excurrent. Caps. erect subcylindric, peristome convolute. (T. XXXVII, D.)

SYN.—*Didymodon fragilis* DRUMM. Musci Amer. bor. i, n. 127 (1828). HARTM. in Nya bot. not. 1855, p. 48.

Tortula fragilis WILS. in HOOK. Journ. Bot. iii, 437 (1841). C. HARTM. Skand. fl. 7 ed. 377 (1858). DE NOT. Musc. ital. I, 68, t. 35 (1862); Epil. bri. ital. 557 (1869). LINDB. de Tort. 253 (1864). HOBK. Syn. br. m. 73 (1873).

Trichostomum fragile C. MUELL. Synops. i, 586 (1849).

Barbula fragilis BR. SCHIMP. Bry. eur. fasc. 62—64, Suppl. t. 4 (1855), Coroll. 141 (1855). SCHIMP. Synops. 181 (1860), 2 ed. 219. LINDB. in Oefv. vet. ak. foerh. xx, 387 (1863). JURATZ. Laubm. oesterr.-ung. 123 (1822). LESQ. JAMES Mosses N. Amer. 129 (1884).

Campylopus Hartmani SCHIMP. MSS. HARTM. in Nya bot. not. 1855, p. 49.

Tortula Drummondii MITT. Journ. Lin. soc. i, Suppl. 27 (1859). LINDB. in HARTM. Skand. fl. 8 ed. 392 (1861).

Barbula Drummondii MILDE Bry. siles. 124 (1869).

Mollia fragilis LINDB. musc. scand. 21 (1879).

Dioicous; in wide dense tufts, yellow-green above, fuscous below. Stems erect, straight, rigid, simple or dichotomous, densely matted with brown tomentum. Leaves very crowded, erecto-patent, lanceolate-subulate, very fragile in the upper part, the margin plane, crenulate, the comal from an elongated base, capillaceo-subulate; nerve when dry very glossy and whitish on the back, excurrent in a triquetro-semiterete subula; basal cells very thin and hyaline, prolonged far up the margin in a narrowing band, apical minute, highly chlorophyllose, obscure from the dense covering on both sides of truncate papillæ, descending into the hyaline base with an acute angle. Caps. erect, short-necked, from ovate, oblong and subcylindric, regular or lightly curved, lid two-

thirds length of caps. from a conic base, obliquely rostrate; teeth very scabrous, slender, 2—3 times convolute, falling away with the columella.

Male infl. terminal, subdiscoid, with numerous antheridia, bracts lanceolate-subulate.

HAB.—Wet mountain rocks, always sterile.

Ben Lawers (*McKinlay* 1865) ! ! Clova (*Fergusson*) ! ! Ben Laoigh, Perth (*Ewing* 1885). Roundstone, Connemara (*Moore* 1853) ! !

Very like *M. tortuosa*, but distinguished by its straight leaves with longly excurrent triangular nerve.

8. LEPTODONTIUM HAMPE.

Linnæa xx, 70 (1847).

Leaves squarroso-reflexed, complicato-concave, flexuose, the margin serrulate or eroso-crenulate. Caps. leptodermous, narrow, erect, lid conic, peristome of 32 filiform, straight, erect, smooth teeth, unequal, separate or anastomosing here and there in pairs, or connascent; calyptra cucullate.—Der. λεπτος slender and οδους a tooth.

A small but natural genus, of which the types are the East Indian *L. squarrosum* (HOOK.) HAMPE and *L. aggregatum* C. MUELL. and principally distinguished by the squarrose serrate leaves.

Another European species is the rare *Trichostomum subalpinum* DE NOT.

CLAVIS TO THE SPECIES.

Stems short, slender; leaves without a paler border.	
Leaves broad at point, nerve vanishing.	*flexifolium*
—— acuminate at point, nerve excurrent, gemmiferous.	*gemmascens*
Stems tall, robust; leaves with a pale border.	*recurvifolium*

1. LEPTODONTIUM FLEXIFOLIUM (*Dicks.*) *Hampe.*

Dioicous; short, nearly simple. Leaves reflexed, oblong-ligulate, apiculate, coarsely serrate at apex, nerve lost at or below the point. Caps. small, narrowly cylindric, lid conic with a short obtuse point. (T. XXXVII, E.)

SYN.—*Bryum flexifolium* DICKS. pl. crypt. III, 5, t. 7, f. 9 (1793). WITH. Bot. arr. br. veg. 3 ed. iii, 815 (1796). HULL Br. fl. P. 2, 258 (1799). BRID. Musc. rec. II, P. III, 55 (1803).

Trichostomum flexifolium SM. Fl. brit. 1246 (1804), Eng. bot. t. 2493. BRID. Sp. musc. I, 242 (1806), Mant. 86 (1819), Bry. univ. i, 499 (1826). C. MUELL. Synops. i, 577 (1849). MILDE Bry. siles. 106 (1869).

Didymodon flexifolium HOOK. TAYL. Musc. br. 66, t. 20 (1818). GRAY Nat. arr. br. pl. i, 742 (1821). HOOK. Fl. scot. P. II, 135 (1821); Br. fl. ii, 28 (1833). SCHWAEG. Suppl. II, P. 2, t. 184 (1826). BR. SCHIMP. Bry. eur. fasc. 29—30, Mon. 6, t. 4 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 103 (1848). WILS. Bry. brit. 109, t. 20 (1855). SCHIMP. Synops. 133 (1860), 2 ed. 163. BERK. Handb. br. m. 265 (1863). HOBK. Syn. br. m. 60 (1873). HUSN. Mouss. nord-ouest 69 (1873).

Leptodontium flexifolium HAMPE Linnæa xx, 70 (1847). LINDB. De Tort. 227 (1864).

Dioicous; gregariously cæspitose, nearly simple, ½—2 in. high, fragile, yellowish, succulent. Leaves reflexed, squarroso-patulous, flexuose when moist, curled when dry, from an erect base, oblong-ligulate, apiculate, coarsely and unequally serrate at apex, carinate, margin plane above, recurved below, nerve vanishing just below the apex; cells at base elongated, pellucid, smooth, above small, hexagonal rounded, finely papillose, perich. bracts broader, vaginant. Caps. on a long slender yellowish seta, erect, narrowly cylindric, leptodermous, fuscous, when dry sulcate, slightly contracted below the mouth; lid conic with a short obtuse point; annulus narrow, fragmentary; teeth slender, fugacious, nearly entire, bifid or cohering, pale, smooth, arising below the orifice of caps. Male plant more slender, infl. terminal, bracts ovato-lanc., concave, erecto-patent serrate.

HAB.—Bare gravelly and turfy places, not common. Fr. 2—4.

Croydon (*Dickson*). Ben Ledi and Callander (*Walker-Arnott*). Buxton (*Greville*). Congleton Cloud and Alderley Edge, Cheshire, c. fr. (*Wilson*) ! ! Wrexham c. fr. (*Bowman* 1835) ! Manchester c. fr. (*Hobson*) ! Todmorden c. fr. (*Nowell* 1848) ! Forley, Derby, c. fr. (*Hunt*) ! Blackdown, Sussex (*Mitten*). Glenprosen, Clova. c. fr. (*Fergusson*) ! ! Powder hill and Bagley wood, Oxon., c. fr. (*Boswell* 1863) ! ! Penzance (*Curnow*) !

This moss appears to be more frequent in Britain than on the Continent, and is not found in S. Europe. *Did. styriacus* JURATZ. appears to be only a variety with the leaves erecto-patent and more distantly serrated.

2. LEPTODONTIUM GEMMASCENS (*Mitt.*) *Braithw.*

Short, laxly tufted, nearly simple. Leaves oblong-lanceolate, erecto-patent, the nerve excurrent and bearing obovate gemmæ at point, margin serrulate at apex. (T. XXXVIII, A.)

SYN.—*Didymodon gemmascens* MITT. MSS.

Didymodon flexifolius Var. *β. gemmiferus* SCHIMP. Synops. 2 ed. 164 (1876).

Streptopogon gemmascens MITT. Phil. Trans. v. 168, p. 33 (1879).

Stems short, fragile, ½—2 in. high, laxly tufted, scarcely branched, bright green above, fuscous at base. Leaves oblong-lanceolate, acuminate, erecto-patent, the lower shorter, somewhat recurved, margin erect, minutely spinuloso-serrate at apex; nerve in the lower leaves reaching point, in the upper excurrent and bearing at tip a globular mass of obovate green gemmæ, often having fine radicles intermixed; cells at base elongated and pellucid, above rounded, papillose on both sides. Fruit unknown.

HAB.—Old thatched roofs in Sussex.

Hurstpierpoint and Amberley (*Mitten* 1845) ! ! Near Liff, Dundee (*Fergusson*).

Although Mr. Mitten has referred this moss to another genus, in the absence of fruit I prefer retaining it near *Leptodontium flexifolium*, to which in areolation it is certainly allied, though quite distinct as a species; the leaves are not squarrose, but divergent, and the gemmæ have 2—3 transverse septa.

Although it disappears with the removal of the thatch, when this has been renewed and is passing into decay, *L. gemmascens* is certain to reappear.

3. LEPTODONTIUM RECURVIFOLIUM (*Tayl.*) *Lindb.*

Dioicous; tall, loosely cæspitose. Leaves squarrose, elliptic-oblong, pale-bordered, coarsely serrate, nerve excurrent in an apiculus. (T. XXXVIII, B.)

SYN.—*Bryum recurvifolium* TAYL. MSS.

Didymodon recurvifolius WILS. Bry. br. 110, t. 41 (1855). BERK. Handb. br. m. 266 (1863). HOBK. Syn. br. m. 60 (1873). SCHIMP. Synops. 2 ed. 165 (1876).

Leptodontium recurvifolium LINDB. De Tort. 227 in obs. (1864).

Dioicous; in lax irregular tufts, deep green above, fuscous or black below. Stem 1—4 in. high, geniculate, erect, free from radicles. Leaves from an erect base, squarrose, patulous and somewhat recurved from the middle, crispate and undulate when dry, from an ovate or oblong base, broadly lanceolate, or elliptic oblong, obtuse, somewhat coriaceous; nerve thin semiterete, broader below, excurrent in a short apiculus; margin plane, serrate in the upper half; basal cells minute, pellucid, rectangular, upper rounded, minutely papillose, opake with chlorophyl, except the 3—5 marginal rows which are empty, smooth, and form a pale border. Fruit unknown.

HAB.—Wet rocky places in mountains, very rare.

Knockavohila, Killarney (*Taylor* 1842)! Ben Voirlich by Loch Lomond (*McKinlay* 1863)! Glyder Vaur (*Griffith* 1878)!! Tyn-y-groes (*Holt* 1885)!!

This fine moss appears to be extinct both in the Irish and Scotch localities, so that its discovery in Wales is an interesting event. The Ben Voirlich plant has the leaves more coarsely areolate, with a stronger nerve, the apex more obtuse and larger serratures.

9. BARBULA HEDW.

Fund. musc. II, 92 (1782).

Plants cæspitose, branched, slender, usually tinged with rufous- or rusty-brown. Leaves small, from an oval base, gradually lanceolate, not accrescent upward; nerve terete, vanishing or rarely excurrent;

basal cells small, rectangular, slightly hyaline, upper small, incrassate, rotundate, or quadrate. Caps. oval or cylindraceous, peristome of 16 teeth on a very short membrane, cleft to base into two slender legs, papillose, short or imperfect, or longer and spirally twisted, sometimes wanting. Der.—*barba*, a beard.

Although *Barbula* and *Tortula* have generally been combined, and must be if we limit our views by the peristome alone, the habit and general aspect of the species are so distinctive, that it is far more convenient to keep them separate. These in *Barbula* are the rusty tinge which more or less pervades the plants, and the lanceolate leaves gradually tapering to an acute point, appressed when dry, with recurved margins, the cells of the upper part being rounded or quadrate and well defined. We have also in Europe *B. bicolor* BR. SCH.—*B. Lamyi* (SCHIMP.)—*B. cordata* (JURATZ.)—*B. rufa* (LORENTZ)—*B. flavipes* BR. SCH.—*B. gigantea* FUNCK—*B. crocea* BRID.—*B. icmadophila* BR. SCH. and *B. obtusula* LINDB. Schimper's B. *Woodii* is nothing but *Amphoridium Mougeotii*.

CLAVIS TO THE SPECIES.

Gymnostomous. — *curvirostris.*
Peristomate.
- Leaves without thickened limb.
  - Peristome short, erect.
    - Infl. paroicous, lower leaves red. — *rubella.*
    - Infl. dioicous.
      - Leaves acute, nerved to apex.
        - L. ovato-lanc., basal cells rounded, per. short, pale. — *lurida.*
        - L. lanc.-acuminate, basal cells rectang. per. longer, red. — *rigidula.*
      - Leaves obtuse, nerve vanishing below apex.
        - L. short, ovato-lanc., caps. oblong. — *brevifolia.*
        - L. long, lanc.-acuminate, caps. cylindric. — *spadicea.*
  - Peristome elongated, contorted.
    - Leaves squarroso-recurved.
      - L. dense, gradually acuminate, acute. — *fallax*
      - L. distant, strongly recurved, short pointed. — *reflexa.*
    - Leaves erecto-patent.
      - L. points acuminate, very acute.
        - Nerve excurrent.
          - L. ovate acuminate, aristate with the thin nerve. — *acuta.*
          - L. ovato-lanc. cuspidate with the thick nerve. — *Hornschuchii.*
        - Nerve vanishing just below apex.
          - Margin of leaf entire. — *cylindrica.*
          - Margin sinuous in upper part, serrate at apex. — *sinuosa.*
      - L. points short, obtuse.
        - Perich. bracts large, convolute. — *convoluta.*
        - Perich. bracts not conspicuous.
          - L. short, linear, revolute at margin — *revoluta.*
          - L. oblong-lanc., margin revolute in lower half. — *unguiculata.*

Leaves surrounded with a thickened limb. — *mucronata.*

Sect. 1. HYMENOSTYLIUM (*Brid.*) Tall, densely cæspitose, much branched. Capsule ovate or oval, truncate, gymnostomous; lid with a long beak.

1. BARBULA CURVIROSTRIS (*Ehrh.*) *Lindb.*

Dioicous; tall, densely cæspitose. L. linear-lanc., acute, with recurved margins, nerve vanishing at apex. Caps. ovate, gymnostomous; lid obliquely rostrate, systylious. (T. XXXVIII, D.)

SYN.—*Pottia curvirostris* EHRH. Beitr. i, 188 (1787).

Gymnostomum curvirostre HEDW. Stirp. cr. ii, 68, t. 24 (1789), Sp. musc. 33 (1801). HOFFM. Deutsch. fl. ii, 28 (1795). BRID. Musc. rec. II, P. I, 45 (1798), Sp. musc. I, 39 (1806), Mant. 18 (1819), Bry. univ. i, 84 (1826). ROTH Fl. germ. iii, P. I, 125 (1800). ROEHL. Moosg. deutsch. 82 (1800). SMITH Fl. brit. 1164 (1804), Eng. bot. t. 2214. P. BEAUV. Prodr. 59 (1805). WEB. MOHR Bot. Tasch. 83 (1807). SCHKUHR Deutsch. kr. gew. P. II, 22, t. 10 (1810). SCHWAEG. Suppl. I, P. I, 32 (1811). WAHLENB. Fl. lapp. 302 (1812). MART. Fl. crypt. erl. 122 (1817). HOOK TAYL. Musc. brit. 11, t. 6 (1818). HARTM. Skand. fl. 382 (1820). GRAY Nat. arr. br. pl. i, 714 (1821). HOOK. Fl. scot. P. II, 122 (1821), Br. fl. ii, 7 (1833). NEES HORNSCH. Bry. germ. 170, t. 11, f. 34 (1823). HUEBEN. Musc. germ. 55 (1833). MACK. Fl. hib. P. 2, 9 (1836). DE NOT. Syllab. 289 (1838). Epil. bri, ital. 602 (1869). BR. SCH. Bry. eur. fasc. 33—36, p. 8, t. 7 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 122 (1848). WILS. Bry. brit. 42, t. 6 (1855). SCHIMP. Synops 43 (1860), 2 ed. 43. BERK. Handb. br. m. 294 (1863). HOBK. Syn. br. M. 32 (1873). JURATZ. Laubm. oesterr.-ung. 15 (1882). LESQ. JAMES Mosses N. Amer. 54 (1884).

Bryum stelligerum DICKS. Crypt. fasc. II, 3, t. 4, f. 4 (1790).

Gymnostomum stelligerum BRID. Musc. rec. II, P. I, 46 (1798), Sp. musc. I, 39 (1806), Mant. 18 (1819), Bry. univ. i, 89, p.p. SCHRAD. Journ. bot. ii, P. I, 55 (1799). SMITH Fl. brit. 1164; Eng. bot. t. 2202.

Gymnostomum æruginosum (non SMITH). NEES HORNSCH. op. c. 160, t. 10, f. 19.

Weissia curvirostris C. MUELL. Synops. i, 658 (1849).

Hymenostylium curvirostre MITT. Journ. Linn. soc. i, Suppl. 32 (1859). LINDB. De Tort. 230 (1864). MILDE Bry. siles. 48 (1869).

Barbula curvirostris LINDB. Musc. scand. 22 (1879).

Dioicous; in soft tumid tufts, yellow-green above with a fuscous tinge, ferruginous below. Stems 1—4 in. high, fragile, much branched, fastigiate, radiculose. Leaves erecto-patent, scarcely incurved when dry, lanc. acute, carinate, minutely papillose, margin recurved, often subserrated above the base, nerve semi-terete, prominent at back, vanishing below apex; cells at base pellucid, elongated, above quadrate and oval, papillose. Seta straw-colored, reddish at base. Caps. ovate, or subspherical, pachydermous, gymnostomous, rufous, glossy, when old turbinate; lid from a conic base, with a long subulate oblique beak, systylious and long persistent; calyptra reaching middle of caps. long-beaked. Male plants similar to the female, infl. terminal, bracts ovate, acute.

HAB.—Alpine calcareous rocks. Fr. 9.

Var. *β.* **commutata** (*Mitt.*) *Lindb.*

Plants taller, more rigid, tinged with brown; leaves long, narrow, erect, more obtuse, the cells all more or less rectangular, pellucid, smooth. (T. XXXVIII, E.)

SYN.—*Hymenostylium commutatum* MITT. Journ. Linn. Soc. i, Suppl. 32 (1859).
Barbula curvirostris var. *commutata* LINDB. Musc. Scand. 22 (1879).

HAB.—In similar localities, but less frequent.

Nant-y-Fydd, Wrexham (*Bowman*)!! Trefriew, N. Wales (*Dr. Wood* 1861)! Pont-y-Prid (*Holmes* 1878)!! Ptarmigan Mtn., Perth (*Holt* 1880)!! Cautley Spout, Yorks. (*West* 1881)!! Glen Meay, I. of Man (*Holt* 1880)!! Ravensdale, Derby (Holt 1883)!! Ben Laoigh, Perth (*Ewing* 1884)!! Gainford, Durham (*R. Barnes* 1887)!!

Frequently met with on mountain rocks and often encrusted with lime. It varies greatly in height and density, and also in the form of capsule and length of leaves, and after much study we have come to the conclusion that *H. commutatum* cannot be maintained as a species, for the two forms of areolation run into each other, even on the same plant.

B. curvirostris much resembles *Mollia æruginosa*, but may be known by its broader leaves with recurved margins and narrower nerve, the cells lax and hyaline at base, quadrate and well defined above, the pachydermous rufous capsule, and subulate systylious lid.

Lindberg distinguishes three forms of the species, α. *scabra* with shorter leaves, and scabrous, quadrate cells. β. *læviuscula* with long narrow leaves, and scarcely scabrous quadrate cells. γ. *commutata*, with long narrow leaves, and smooth rectangular cells.

Sect. 2. ERYTHROPHYLLUM *Lindb.* Leaves lanceolate, acuminate, the lower rusty red. Capsule subcylindric, teeth 16, lanceolate, tender, with scarcely any basal membrane.

2. BARBULA RUBELLA (*Hoffm.*) *Mitt.*

Paroicous. Leaves recurved, lineal-lanceolate, nerved to apex, lower red, margin recurved. Caps. cylindric, lid short-beaked, teeth pale red. (T. XXXIX, A.)

SYN.—*Bryum rubellum* HOFFM. Deutsch. fl. ii, 33 (1795).

Grimmia rubella ROTH Fl. germ. iii, P. I, 149 (1800).

Weissia rubella ROEHL. Moosg. deutsch. 142 (1800).

Grimmia recurvirostris SM. Fl. brit. 1190, excl. syn. (1804); Eng. bot. t. 1438. TURN. Musc. hib. 19 (1804).

Grimmia curvirostris WEB. MOHR Bot. Tasch. 135 (1807). VOIT in STURM Deutsch. fl. ii, heft 14 (1813); Musc. herbip. 29 (1812).

Weissia curvirostra HOOK. TAYL. Musc. brit. 46 excl. syn. t. 14 (1818). HOOK. Fl. scot. P. II, 130 (1821), Br. fl. ii, 22 (1833).

Anacalypta recurvirostris FUERN. in Flora xii, P II, Erg. 25 (1829). NEES HORNSCH. Bry. germ. ii, P. II, 151 excl. syn. t. 37, f. 6 (1831).

Anacalypta rubella HUEBEN. musc. germ. 119 (1833).

Didymodon rubellus BR. SCH. Bry. eur. fasc. 29-30, p. 3 excl. syn. t. 1 (1846). WILS. Bry. br. 106, t. 14 (1855). SCHIMP. Synops. 130 (1860), 2 ed. 160. BERK. Handb. br. m. 264 (1863). HOBK. Syn. br. m. 58 (1873). HUSN. Mouss. nord-ouest 68 (1873), Musc. gall. 82, t. 23 (1885). JURATZ. Laubm. oesterr.-ung. 98 (1833). LESQ. JAMES Mosses N. Amer. 104 (1884).

Trichostomum rubellum RABENH. Deutsch. kr. fl. ii, S. III, 115 excl. syn. (1848). C. MUELL. Synops. i, 581 excl. syn. (1849). HARTM. Sk. fl. 7 ed. 381 (1858). LINDB. De Tort. 226 (1864). MILDE Bry. siles. 101 (1869).

Barbula rubella MITT. Journ. Linn. soc. xii, 162 (1869). LINDB. Musc. scand. 22 (1879).

Paroicous and synoicous; cæspitose, deep green above, ferruginous red below, ½—2in. high, slender, branched. Leaves curled when dry,

patent and recurved when moist, the lower lanceolate, upper suddenly larger, from an erect concave base, lineal-lanceolate, acuminate, carinate, minutely papillose on both sides, the margin recurved, nerve terete, vanishing below or in the apex; cells at base pellucid rectangular, above small quadrate and chlorophyllose. Perich. bracts longly sheathing, thin; caps. erect, on a long reddish seta, cylindraceous, rarely oblong or oval, leptodermous, pale brownish-green, finally reddish; annulus of two rows of large cells, very fragile, lid conic, with a short straight or slightly oblique beak; per. on a short basal membrane, pale red, soft, of 16 flat linear teeth, rarely cleft or perforated, the articulations nodose and papillose. Antheridia usually naked in the axils of the perich. bracts.

HAB.—Walls, rocks and stony ground, principally in subalpine districts. Fr. 8—9.

Var. β **dentata** (*Schimp.*)

Plants dingy green, the leaves longer, with the margin recurved only to the middle and toothed toward apex.

SYN.—*Didymodon rubellus β dentatus* SCHIMP. Synops. 131.
Didymodon dentatus JURATZ. MSS.
Trichostomum alpigenum VENT. MSS.
Didymodon alpigenus JURATZ. Laubm. oesterr..ung. 98.

HAB.—Wet stony places on mountains.

Clayton downs, Sussex (*Mitten*)! Schiehallion (*Braithwaite* 1884)! ! Coneysthorpe, Yorks. (*Spruce* 1878). Miller's dale (*Holt* 1879)! ! Ingleborough (*Cash* 1880)! !

VAR. γ. **ruberrima** (*Fergusson*).

Plants more slender, slightly branched, ½—2in. high; leaves short, more distant, all vinous red, entire, from an oblong base, suddenly narrowed near the middle and incurved at margin, acutely acuminate.

HAB.—Mountain rocks.

Head of Glen Lochay (*Arnott and Borrer*)! Glen Tilt (*West* 1880)! ! Ben Lawers (*Braithwaite* 1865)! ! Clova (*Fergusson*)! !

Barbula rubella varies considerably in size and density, but is very uniform in the fruit, and always more or less red in the lower leaves. In Var. β. the denticulation varies much, but in no case have I seen it so spinulose as in continental specimens. The Var. γ. differs widely from the type, and has quite the aspect of a distinct species, indeed it was recorded as *Didymodon rufus* LORENTZ, but *Barbula rufa* has a broader leaf, gradually narrowing upward, the base of different shape with smaller and more numerous cells, and the areolation of upper part not opaque and indistinct.

Sect. 3. EUBARBULA *Lindb.* Plants slender or robust, young leaves green, becoming more or less of a rusty brown colour, lanceolate with recurved margins; caps. narrow, teeth short or rudimentary, or long and convolute.

3. BARBULA LURIDA (*Hornsch.*) *Lindb.*

Dioicous; cæspitose. Leaves straight, fuscescent, ovato-lanc., nerved to apex, the margin recurved. Caps. oblongo-cylindric, teeth pale yellow, short, cleft. (T. XXXIX, B.)

SYN.—*Didymodon luridus* HORNSCH. in L. Syst. veg. 16 ed. iv, P. I, 173 (1827). BR. SCH. Bry. eur. fasc. 29-30, p. 4, t. 2 (1846). RABENH. Deutsch. kr. fl. ii, S. 3, 102 (1848). WILS. Bry. br. 107, t. 41 (1855). SCHIMP. Synops. 131 p.p. (1860), 2 ed. 161. BERK. Handb. br. m. 265 (1863). DE NOT. Epil. bri. ital. 566 (1869). HOBK. Syn. br. m. 59 (1873). HUSN. Mouss. nord-ouest 68 (1873), Musc. gall. 83, t. 23 (1885). JURATZ. Laubm. oesterr.-ung. 99 (1882). LESQ. JAMES Mosses N. Amer. 104 (1884).

Barbula deusta BRID. Bry. univ. i, 553 (1826).

Cynodon luridus HORNSCH. MSS. BRID. Bry. un. i, Suppl. 818 (1827).

Didymodon trifarius HUEBEN. Musc. germ. 288 (1833).

Trichostomum luridum SPRUCE in Ann. mag. n. h. 2 ser. iii, 379 (1849). LINDB. in Oefv. vet. ak. förh. xvi, 210 (1859), De Tort. 226 (1864). HARTM. Skand. fl. 8 ed. 397 (1861). MILDE Bry. siles. 102 (1863).

Trichostomum trifarium (non SM.) C. MUELL. Synops. i, 574, excl. syn. (1849).

Barbula trifaria MITT. Journ. Lin. soc. i, Suppl. 36 (1859).

Barbula lurida LINDB. Musc. scand. 22 (1879).

Dioicous; in small bright green tufts, with a lurid brownish tint when old and dry; stems simple or branched. Leaves patulous when moist, straight and subimbricated when dry, lower broadly ovato-lanc., upper oblongo-lanc., shortly acuminate, sometimes muticous, very concave, nearly smooth, margin reflexed but flat below the point, nerve rufescent, stout, vanishing at or below apex; areolation very distinct, minutely hexagono-rectangular, a little laxer at base. Perich. bracts erect, oblongo-elongate, subvaginant, rather laxer; caps. oval, oblong or subcylindric, equal or a little curved, ferruginous, leptodermous, annulus very narrow, persistent, lid narrow conic, straight or slightly curved; teeth very slender, irregular or rudimentary, simple or bipartite, pale yellow, nearly smooth, without basal membrane. Male plant more slender, infl. terminal, gemmiform, bracts ovato-lanceolate.

HAB.—Limestone walls or crumbling sandstone. Fr. 11—12.

Near Cork (*Wilson* 1829)! Trebarth (*Wilson* 1864). Kent and Sussex (*Mitten*). Welburn, Yorks. (*Spruce* 1847)! Mutley, Lipson and Laira, Plymouth (*Holmes* 1867)!! Troup head (*Rev. J. Fergusson* 1869)!! Headington, Oxford (*Boswell* 1880)!! Uffmoor wood (*Bagnall* 1872)!! Tralee (*Moore*). Woolsonbury hill (*Mitten*). Coneysthorpe, Yorks. (*Slater* 1880)!! Wetherby, Yorks. (*Wesley* 1875)!! Banks of the Hodder, Clitheroe (*Burgess & Holt* 1886)!!

This moss varies much in size and density, sometimes reaching a height of 2 inches; the teeth of peristome will always distinguish it from *B. brevifolia* and *rigidula*, but the older synonyms of all three species are sadly confused.

4. BARBULA BREVIFOLIA (*Dicks.*) *Lindb.*

Dioicous; cæspitose. Leaves straight, fuscescent, ovato-lanc. nerved to apex, the margins recurved. Caps. oblongo-cylindric, teeth pale red, cleft to base, on a basal membrane. (T. XXXIX, C.)

SYN.—*Bryum trichodes, erectis capitulis fusco-nigris* DILL. in RAY Synops. 3 ed. 96 (1724).

Bryum palustre brevifolium, capsulis nigricantibus DILL. Hist. musc. 377, t. 47, f. 39 (1741) et Herb.

Weissia recurvirostris HEDW. Stirp. i, 19, t. 7 (1787)?

Bryum brevifolium DICKS. Pl. crypt. fasc. II, 4 (1790).

Trichostomum lineare SM. Fl. br. 1246, excl. syn. (1804), Eng. bot. t. 1598. DAVIES Welsh bot. 108 (1813). DE NOT. Syllab. 186 (1838).

Tr. linoides SM. op. c. 1247 excl. syn. Eng. bot. t. 2295.

Tr. trifarium SM. op. c. 1235 excl. syn. Eng. bot. t. 1707.

Didymodon trifarius (non SWARTZ) HOOK. TAYL. Musc. brit. 67, t. 20 (1818). HOOK. Fl. Scot. 136 (1821); Br. Fl. ii, 30 (1833). WAHLENB. Fl. suec. ii, 1074 (1826). AHNFELT in FR. Fl. scan. 239 (1835).

Trichostomum tophaceum BRID. Mant. 84 (1819), Bry. univ. i, 495 (1826). DE NOT. Syll. 187 (1838), Epil. bri. ital. 506 (1869). BR. SCH. Bry. eur. fasc. 18-20, p. 9, t. 6 (1843). RABENH. Deutsch. kr. fl. ii, S. III, 114 (1848). C. MUELL. Synops. i, 573 (1849). WILS. Bry. br. 113, t. 20 (1855). SCHIMP. Synops. 149 (1860), 2 ed. 169. BERK. Handb. Br. m. 260 (1863). LINDB. De Tort. 227 (1864). MILDE Bry. siles. 103 (1869). HOBK. Syn. br. m. 60 (1873). HUSN. Mouss. nord-ouest 73 (1873), Musc. gall. 85, t. 24 (1885). LESQ. JAMES Mosses N. Amer. 109 (1884).

Anacalypta tophacea BRUCH in NEES HORNSCH. Bry. germ. ii, P. II, 148, t. 37, f. 5 (1831). HUEBEN. Musc. germ. 120 (1833).

Barbula tophacea MITT. Journ. Linn. soc. i, Suppl. 35 (1859).

Barbula brevifolia LINDB. musc. scand. 22 (1879).

Didymodon tophaceus JURATZ. Laubm. oesterr.-ung. 100 (1882).

Dioicous; in dense tufts, olive green above, reddish below, often coated with calcareous deposit. Leaves from an erect base, patulous, very minutely verruculose, from ovate, lineal-lanc., obtuse, carinate, concave, nerve vanishing below apex, margin revolute, cells minute, rounded, incrassate, at base laxer, shortly rectang., hyaline. Perich. bracts larger, erect, more obtuse. Caps. on a thickish red seta, erect, ovate or oblong, rufo-fuscous; annulus not defined; lid with an oblique beak; per. tubular at base, the teeth imperfect or unequal, pale or red, legs partly free, partly connate. Male plant more slender; infl. gemmiform, bracts ovate, acuminate, nerved.

HAB.—Calcareous rocks and walls. Fr. 10—2.

Glasgow. Clapham springs (*Abbott*). Teesdale (*Backhouse*). Winwick stone quarry (*Wilson* 1843)!! Sussex (*Mitten*). Crambeck, Castle Howard, and near York (*Spruce* 1847)! Ramsden Clough and Todmorden (*Nowell* 1841)!! Marple, Bowdon, and Southport (*Hunt* 1865)!! Killiney (*Sim* 1867)!! Menai declivity (*Hunt* 1868)!! Ulverston (*Miss Hodgson*)!! Gordale and Otley (*Hobkirk*). Erdington and Barnt Green, Birmingham (*Bagnall*)!! Clifton, Manchester (*Wild* 1874). Plymouth (*Holmes*). Wetherby (*Wesley* 1878)!! Wembury, Devon, a very dwarf dense form (*Holmes*)!! Berwick coast (*Hardy*). Balcaskie, Fife (*Howie* 1863)! Springs in the cliff at Eastbourne, *forma luxurians* (*Roper* 1887)!! and at Hastings (*Jenner*)!

Var. *β.* **acutifolia** *Schimp.*

Less robust, leaves longer, narrower, acutely acuminate, when moist recurvo-patulous.

SYN.—SCHIMP. Synops. 2 ed. 170.

HAB.—Sandstone rocks near Warrington (*Wilson*). Wet clay soil near Manchester (*Dr. Wood*). Headington Hill, Oxford (*Boswell* 1881)!!

Very variable in size and colour according to the locality, but distinguished from the last species by its obtuse leaves, shorter nerve and more highly developed peristome. Dickson's *Bryum brevifolium* is certainly identical with the typical form of the plant.

5. BARBULA FALLAX *Hedw.*

Dioicous; slender, fuscescent. Leaves lax, twisted when dry, squarrosely recurved when wet, ovate-lanceolate, margin recurved, nerve vanishing at point. Caps. narrowly ovate-oblong, peristome convolute. (T. XXXIX, D.)

SYN.—*Muscus capillaris parvus, cauliculis tenuibus longiusculis, foliolis brevibus angustis acutis rarioribus cinctis.* RAY Synops. 2 ed. 31, n. 18 (1696).

Bryum perangustis foliis et cauliculis, foliis rarioribus cinctis, capitulis erectis e surculis annotinis egredientibus DILL. Cat. giss. 225 (1719), in RAY Synops. 3 ed. 99 (1724).

Bryum tenue barbatum, foliis angustioribus et rarioribus DILL. Hist. musc. 385, t. 48, f. 49 (1741).

Barbula fallax HEDW. Stirp. cr. i, 62, t. 24 (1787). Sp. musc. 120 (1801). BRID. musc. rec. II, P. I, 201 (1798), Mant. 92 (1819), Bry. univ. i, 556 (1826). WEB. MOHR Bot. Tasch. 211 (1807). ROEHL. Moosg. deutsch. 436 (1800), Deutsch. fl. iii, 45 (1813). SCHWAEG. Suppl. I, P. I, 127 (1811). WAHLENB. Fl. lapp. 318 (1812). MART. Fl. cr. erl. 89 (1817). SCHULTZ Recens. Barb. et Syntr. 211, t. 33, f. 21 (1823). HUEBEN. Musc. germ. 326 (1833). BR. SCHIMP. Bry. eur. fasc. 13-15, p. 23, t. 9 (1842). SCHIMP. Synops. 169 (1860), 2 ed. 205. RABENH. Deutsch. kr. fl. ii, S. 3, 106 (1848). C. MUELL. Synops. i, 616 (1849). MILDE Bry. siles. 119 (1869). HUSN. Mouss. nord-ouest 81 (1873), Musc. gall. 105, t. 29 (1886). JURATZ. Laubm. oesterr.-ung. 112 (1882). LESQ. JAMES Mosses N. Amer. 121 (1884).

Mollia fallax SCHRANK Bayer. fl. ii, 458 (1789).

Bryum fallax DICKS. Pl. crypt. F. III, 5 (1793). HOFFM. Deutsch. fl. ii, 44 (1795).

Tortula fallax SCHRAD. Syst. samml. kr. gew. I, n. 53, et in UST. Neu. ann. xiv, 109 (1796). SWARTZ Musc. suec. 40 (1799). ROTH Fl. germ. iii, P. I, 212 (1800). SM. Fl. brit. 1252 (1804), Eng. Bot. t. 2179. TURN. Musc. hib. 47 (1804). P. BEAUV. Prodr. 92 (1805). BRID. Sp. musc. I, 255 (1806). SCHULTZ Fl. starg. 305 (1806). WAHLEN. Fl. carp. 337 (1814). HOOK TAYL. Musc. br. 32, t. 12 (1818). HOOK. Fl. Scot. P. 2, 127 (1821), Br. fl. ii, 46 (1833). GRAY Nat. arr. br. pl. i, 724 (1821). MACK. Fl. hib. P. II, 26 (1836). DE NOT. Syllab. 238 (1838), Musc. ital. I, 58, t. 29 (1862), Epil. bri. ital. 554 (1869). WILS. Bry. br. 123, t. 12 (1855). BERK. Handb. br. m. 257 (1863). HOBK. Syn. br. m. 69 (1873).

Tortula Stokesii TURN. Musc. hib. 48.

Barbula nervosa SCHULTZ Fl. starg. 305 excl. syn. Brid.

Tortula imberbis SM. Fl. brit. 1261 (1804). LINDB. De Tort. 250 (1864).

Dioicous; in lax wide tufts, fuscous-green above, rufescent below, stems 1—3 in. high, fastigiate branched, rooting at base. Leaves rather lax, quickly squarroso-recurved when wet, erecto-patent and twisting when dry, from a broad base narrowly lanceolate, acuminate, carinate, the margin revolute in the lower half, and longitudinally plicate near the base, nerve strong, rufescent, reaching apex or slightly excurrent; cells minute, yellowish, a very few rectangular at base, papillose rounded and incrassate above; perich. bracts longer, semi-vaginant to the middle, thence narrowly lanceolate and patent. Caps. erect, on a flexuose purple pedicel, narrowly ovate-oblong or cylindra-

ceous, very slightly curved, leptodermous, glossy brown; calyptra subulate, prolonged below the lid, annulus indistinct; lid purple, subulate, nearly as long as caps., peristome bright red, long, fragile, on a very narrow basal membrane, many times twisted; spores minute, smooth.

Male plant more branched, infl. terminal, bracts from a broad concave base, narrowly lanc., very faintly nerved.

HAB.—Wet clay and sandy banks and walls; common. Fr. 10—1.

Var. β. **brevicaulis** (*Schwaeg.*)

Stem short simple; leaves crowded, patent, subundulate at margin; caps. shorter as also the lid and peristome.

SYN.—*Barbula brevicaulis* SCHWAEG. Suppl. I, P. I, 126, t. 32. BRID. Mant. 92; Bry. univ. i, 551. SCHULTZ. Recens. 210, t. 33, f. 20.
B. fallax var. *brevicaulis* SCHIMP.—C. MUELL.—WILSON, &c.

HAB.—Wet places. Hastings (*Borrer*)!

Var. γ. **brevifolia** (*Sm.*) *Schultz.*

More densely tufted, slender, fastigiate branched; leaves shorter, ovato-lanc., patulous from the middle, subrecurved; caps. small, peristome shorter.

SYN.—*Tortula brevifolia* SM. Fl. brit. 1259. BRID. Sp. Musc. I, 254.
Barbula brevifolia BRID. Mant. 92; Bry. univ. i, 555.
B. fallax var. *brevifolia* SCHULTZ Recens. 212, t. 33, f. 21, B. SCHIMP.—C. MUELL.—WILSON, &c.

HAB.—Cheddar, Somerset (*Boswell*, 1873)! Bearley, Warwick (*Bagnall*)!! Buxton and Miller's dale (*Holt*, 1883)!!

This common moss varies from ½ to 2 inches in height, and is always of a brown or rusty tint; a tuft of it in fruit has a very pretty appearance from the neat capsules with long acutely pointed lids.

6. **BARBULA REFLEXA** *Brid.*

Dioicous; leaves rufescent, ovato-lanceolate, incumbent when dry, strongly recurved when wet, acutely carinate, margin reflexed below, nerve vanishing. Caps. cylindric. (T. XXXIX, E.)

SYN.—*Tortula reflexa* BRID. Sp. musc. I, 255 (1806). BRAITHW. in SEEM. Journ. Bot. 1871, p. 293, t. 120, f. 2.
Barbula reflexa BRID. Mant. musc. 93 (1819).
B. fallax var. γ. *reflexa* BRID. Bry. univ. i, 558 (1826).
Schistidium ? recurvifolium WILS. MSS. SPRUCE in Ann. Mag. n. h. 2 ser. iii, 491 (1849).
Grimmia recurvifolia WILS. MSS.
Tortula fallax var. δ. *recurvifolia* WILS. Bry. brit. 124 (1855).
Barbula recurvifolia SCHIMP. Coroll. Bry. eur. 141 (1855), Synops 170 (1860), 2 ed. 206. MITT. Journ. Linn. soc. i, Suppl. 34 p.p. (1859). MILDE Bry. siles. 121 (1869). JURATZ. Laubm. oesterr.-ung. 112 (1882). LESQ. JAMES Mosses N. Amer. 122 (1884).
Tortula recurvifolia BERK. Handb. br. m. 258 (1863). LINDB. De Tort. 250 (1864). DE NOT. Epil. bri. ital. 555 (1869).

Dioicous; plants tall, slender, crowded into lax rufo-fuscous tufts. Leaves when dry laxly incumbent and slightly twisted, when wet suddenly falcato-recurved, subtrifarious, from an oblong base, lanceolate, shorter and broader than those of *B. fallax*, more solid, acutely carinate, with stronger longitudinal folds at base, strongly papillose on both sides, nerve fuscous, of equal width, vanishing in the apex, margin erect, plane above, resupinato-reflexed towards base, one wing reflexed almost from the middle; cells as in last, lowest basal rather larger, quadrate and rectangular, pachydermous, upper rounded. Calyptra very narrow, prolonged to ⅓ of capsule, subulate; caps. erect, elongate, cylindraceous, regular, rufo-fuscous; lid with a subulate beak; ann. none; peristome of *B. fallax*. Male plant more slender.

HAB.—Among earth on limestone rocks and walls; not common.

Above Airlie Castle, Forfar (*Drummond*)! Buxton and Middleton, Derby (*Wilson*)!! Ingleboro' and Giggleswick Scar. (*Baker* 1855)!! Mucross, Killarney (*Schimper and Wilson* 1865). Barrowfield and Whitbarrow (*Barnes* 1867). Litton and Malham (*Hunt* 1867)!! Ben Lawers (*Hunt*). Hayle sands (*Curnow* 1871)!! Via Gellia, Matlock (*Holmes* 1875). Miller's dale, Castleton and Buxton (*Holt* 1883)!!

Var. *β.* **robusta** *Braithw.*

Stems tall, 3-5 in. high, in lax incoherent tufts; leaves more dense, broader and thicker.

HAB.—Limestone rocks at Ben Bulben, Sligo (*Moore*)!!

The slender form of *B. reflexa* and the carinate strongly recurved leaves, suddenly pointed and never acuminate, at once separates it from *B. fallax*. The fruit is extremely rare, and the drawing of it is copied from Schimper's figures; Mr. Holt finds not unfrequently in the Matlock districts a slender fruiting form of *B. fallax* growing intermixed with *B. reflexa*, for which it may be readily mistaken.

The Var. *β.* was at first referred by Mr. Mitten to *B. gigantea* (*Geheebia catarractarum* SCHIMP.) but that species has much longer leaves with very different areolation. In his Synopsis, 2 ed. Schimper records the latter from Scotland, but no British specimen exists in his herbarium, and it is therefore probably only an erroneous repetition of the Irish record.

7. BARBULA SPADICEA. *Mitt.*

Dioicous; lurid green, laxly tufted. Leaves patent from the base, elongato-lanceolate, nerved to the apex, margin recurved below, cells incrassate and rounded from the base. Caps. cylindric, lid shortly rostrate. (T. XL, A.)

SYN.—*Didymodon rigidulus* BRID. Musc. rec. II, P. I, 116 (1798), Sp. musc. I, 160 (1806), Mant. 100 (1819), Bry. univ. i, 514 (1826). SWARTZ Musc. suec. 38 (1799). ROTH Fl. germ. iii, P. I, 198 (1800). WEB. MOHR Bot. Tasch. 59 (1807). SCHKUHR Deutsch. kr. gew. P. II, 68, t. 30 (1810). SCHWAEG. Suppl. I, P. I, 116 (1811). HUEBEN. Musc. germ. 286 (1833).

Bryum rigidulum DICKS. Pl. crypt. fasc. iv, 12 (1801).

Trichostomum rigidulum (non HEDW.) SM. Fl. brit. 1238 (1804), Eng. Bot. t. 2178. TURN. Musc. hib. 34 (1804). BR. SCHIMP. Bry. eur. fasc. 18-20, p. 10, t. 7 (1843). C. MUELL. Synops. i, 570 (1849). WILS. Bry. brit. 114, t. 20 (1855). SCHIMP. Synops. 148 (1860). HUSN. Mouss. nord-ouest 73 (1873), Musc. gall. 85, t. 24 (1885).

Barbula spadicea MITT. in SEEM. Journ. Bot. 1867, p. 326.

Barbula insidiosa JUR. MILDE Hedwigia 1869, p. 97. MILDE Bry. siles. 120 (1869). JURATZ. Laubm. oesterr.-ung. 111 (1882).

Barbula rigidula SCHIMP. Synops. 2 ed. 206 (1876).

Tortula spadicea BRAITHW. in SEEM. Journ. Bot. 1871, p. 293, t. 119, f. 6. HOBK. Syn. br. m. 69 (1873).

Dioicous; resembling *B. fallax*, but more robust, in looser thicker tufts, dull brownish-green above, fuscous below. Stems 1—2 in. high, simple or branched; leaves when dry incurved and imbricated, when wet patent from the base, spreading and recurved, from a broadly ovate base, elongato-lanceolate, channelled, margin recurved in the lower half, the folds more distinct, nerve strong, distinct to the apex; cells incrassate and rounded-quadrate from the base, only the lowest elongate-oval, obscure above, papillose. Perich. bracts lanceolate, recurved, from a longish lax-celled base, seta red, caps. erect, cylindric, slightly curved, castaneous with a red mouth, annulus of 3—5 rows of small cells, lid shortly rostrate, nearly half length of caps., peristome short, teeth red on a very short orange basal membrane, scarcely twisted. Male plant more slender, infl. terminal, bracts broad, suddenly acuminate.

HAB.—Damp walls, earth covered rocks and sandy banks of rivers; not uncommon. Fr. 9—11.

Forfar (*Croall* 1852)!! Sheddon Clough, Burnley (*Nowell*)!! Buxton (*Wilson* 1863)!! Bolton Abbey (*Hunt* 1868)!! Haselden gill (*Nowell* 1866). Dent (*Barnes* 1872)!! Dovedale (*Holmes* 1875)!! Castleton (*Holt* 1885)!! Glen Prosen (*Fergusson* 1868)!! Crathie (*Sim* 1872)! Belfast (*Stewart* 1877). Newcastle, Co. Down, Fairhead, Antrim (*Rev. H. W. Lett* 1884)!! Eskdale, Yorks. (*Boswell* 1878). Bearley, Warwick (*Bagnall*).

Readily known from *B. rigidula* by the broader-pointed leaves, with thick nerve vanishing just below apex, and very different basal areolation, and from *B. fallax* by the longer leaves with opake rather obtuse points and short non-spiral peristome.

8. BARBULA RIGIDULA (*Hedw.*) *Mitt.*

Dioicous; densely tufted, dingy green. Leaves subrecurved, longly lanceolate from an erect base, nerve ending in the thick obscure point, margin revolute below, basal cells narrowly rectangular. Caps. oval-oblong, lid obliquely beaked. (T. XL, B.)

SYN.— *Muscus trichodes parvus, foliis musci vulgaris, capitulis longis acutis* DOODY. RAY Synops. st. br. 243 (1690).

Muscus Adiantum aureum dictus assurgens, foliolis tenuissimis, capitulis parvis erectis in oblongis pedicellis RAY Syn. 2 ed. 31 (1696).

Bryum perangustis foliis et cauliculis, foliis crebrioribus et circa extremitates magis congestis, capitulis erectis, ad summitatem magis egredientibus DILL. Cat. Giss. 225 (1719). RAY Syn. 3 ed. 99 (1724).

Bryum tenue imberbe et pallidum, foliis crebrioribus. DILL. Hist. musc. 382, t. 48, f. 46 (1741) et Herb.

Didymodon rigidulus HEDW. Musc. fr. iii, 8, t. 4 (1792), Sp. musc. 104. HOOK. TAYL. Musc. brit. 67, t. 20 (1818). HOOK. Fl. scot. P. II, 135 (1821).

Desmatodon rupestris FUNCK in BRID. Bry. univ. i, 822, p.p. (1827).

Trichostomum rigidulum var. *β. densum* BRUCH SCH. Bry. eur. fasc. 18-20, p. 10, t. 7 (1843). WILS. Bry. brit. 114 (1855). SCHIMP. Synops. 149 (1860).

Trichostomum rigidulum C. MUELL. Synops. i, 570 (1849).

Trichostomum neglectum WILS. MSS.

Tortula rigidula LINDB. de Tort. 249 (1864). BRAITHW. in SEEM. Journ. Bot. 1871, p. 293, t. 119, f. 5. HOBK. Syn. br. m. 69 (1873).

Barbula rigidula MITT. in SEEM. Journ. Bot. 1867, p. 326. MILDE Bry. siles. 118 (1869). SCHIMP. Synops. 2 ed. 206 p.p. (1876). JURATZ. Laubm. oesterr.-ung. 110 (1882). LESQ. JAMES Mosses N. Amer. 123 (1884).

Dioicous; densely tufted, subpulvinate, fuscescent or dirty green. Leaves from an erect base, appressed to stem, patent and subrecurved, rigid, when dry somewhat incurved and contorted, longly lanceolate, carinate, recurved in upper margin, revolute below, nearly smooth, basal areolation pellucid, narrowly rectangular, upper distinct, minutely quadrate, nerve brownish, continued with lamina into a thick round, rather obtuse, obscure point. Perich. bracts resembling the upper leaves but more acuminate; caps. on a red seta, oval-oblong, erect, straight or a little curved, brown, glossy; annulus narrow of 3 rows of small cells, lid obliquely beaked, half length of capsule, teeth on a narrow basal membrane, the legs free or partly conjoined, obliquate or subcontorted. Male plant more slender.

HAB.—Damp rocks and shady walls; not uncommon. Fr. 7—9.

Castle Howard (*Spruce* 1884)! Blackdown and Hurstpierpoint (*Mitten* 1847)! Cliviger (*Nowell*)!! Buxton and Borrowdale (*Wilson* 1864)!! Castleton (*Holt* 1883)!! Plymouth and Taunton (*Holmes* 1868)! Whitbarrow and Syergh Fell (*Barnes* 1867)!! Callander and Arrochar (*Hunt* 1868)!! Scalby Mills (*Spruce* 1843)! Banchory and Crathie (*Sim* 1872)! Park Lane, Broughton (*Wild* 1879). Wychewood, Oxon (*Boswell* 1879)!! Loch Maree (*Boswell* 1875)!! Brandon Mtns. (*Moore*). Sleive Gallion, Derry (*Stewart* 1876)!! Wetherby and Boston Spa, Yorks. (*Wesley* 1879)!!

More compact than the last species, and growing in small tufts, never in wide-spreading sheets. On dry walls it is very short and compact, and may be taken for *B. fallax*, but the basal areolation will always distinguish it. The older synonymy of this species and the last is so confused that it is not possible to separate them.

9. **BARBULA ACUTA** *Brid.*

Dioicous; cæspitose. Leaves erecto-patent, ovate, lanceolato-acuminate, margins recurved, nerve excurrent, perich. long, flexuously acuminate. Caps. erect, oblong, exannulate, lid subulate. (T. XL, C.)

SYN.—*Tortula acuta* BRID. Sp. musc. I, 265 (1806).

Barbula acuta BRID. Mant. musc. 96 (1819), Bry. univ. i, 554 (1826).

Barbula gracilis SCHWAEG. Suppl. I, P. I, 125, t. 34 (1811). SCHULTZ Recens. Barb. 198, t. 32, f. 3 (1823). BRID. Bry. univ. i, 536 (1826). BR. SCH. Bry. eur. fasc. 13-15, p. 22,

t. 8 (1842). HUEBEN. Musc. germ. 329 (1833). RABENH. Deutsch. kr. fl. ii, S. 3, 106 (1848). C. MUELL. Synops. i, 609 (1849). SCHIMP. Synops. 171 (1860), 2 ed. 210. MILDE Bry. siles. 117 (1869). HUSN. Mouss. nord-ouest 82 (1873), Musc. gall. 106, t. 29 (1886). JURATZ. Laubm. oesterr.-ung. 114 (1882). LESQ. JAMES Mosses N. Amer. 127 (1884).

Tortula gracilis SCHLEICH. Pl. cr. Helv. (1807). HOOK. GREV. in BREWST. Ed. Journ. i, 300 (1824). DE NOT. Syll. 179 (1838), Musc. ital. I, 57, t. 28 (1862), Epil. bri. ital. 552 (1869). WILS. Bry. brit. 123, t. 32 (1855). LINDB. de Tort. 249 (1864).

Dioicous; in rather dense, low tufts, olivaceous green or fuscescent. Stem simple or slightly branched, rather rigid. Leaves straight, erecto-patent, when dry laxly imbricated, smooth, concave, from an ovate base, lanceolate, cuspidate with the stout fuscous excurrent nerve, margin revolute below, areolation minute, rectang. at base, roundish above. Perich. bracts broader, the nerve prolonged into a long flexuose arista. Caps. on a rigid red seta, erect or subincurved, brown, small, ovate-oblong, with a longish attenuated lid; ann. none, peristome short, orange-red, slightly contorted. Male infl. gemmiform, bracts ovate, acuminate.

HAB.—Limestone walls and sandy ground, rare.

Durdham Downs, Bristol, ster. (*Thwaites* 1843)! St. Helier, Jersey (*Cardot* 1885)!!

Known at once by its short, aristate leaves. and perhaps overlooked from its small size and sterile condition; it is quite probable it will be found in Cornwall. Mr. Thwaites's specimen is very dwarf, but it corresponds in leaf-structure with the true plant.

10. **BARBULA CYLINDRICA** (*Tayl.*) *Schimp.*

Dioicous; laxly tufted. Leaves lanceolate-subulate, patent, nerved to apex, margin recurved below, plane above, cells quadrate at base, obscure above. Caps. erect, elliptico-cylindric, lid conic attenuated. (T. XL, D.)

SYN.—*Zygotrichia cylindrica* TAYL. in MACK. Fl. hib. P. 2, 26 (1836).

Tortula insulana DE NOT. in Mem. acc. Torin. xl, 320 (1838), Syllab. 180 (1838). BRAITHW. in Journ. Bot. 1871, p. 328. HOBK. Syn. br. m. 68 (1873).

Barbula vinealis Var. flaccida BR. SCH. Bry. eur. fasc. 13-15, p. 24 (1842). SCHIMP. Synops. 171 (1860). JURATZ. Laubm. oesterr.-ung. 114 (1882).

Tortula vinealis WILS. Bry. br. 124, t. 42 (1855).

Tortula cylindrica LINDB. Bot. Not. 1865, p. 76.

Barbula cylindrica SCHIMP. Synops. 2 ed. 208 (1876). LESQ. JAMES Mosses N. Amer. 125 (1884). HUSN. Musc. Gall. 106, t. 29 (1886).

Barbula vinealis Var. luxurians JURATZ. in litt.

Barbula insulana HUSN. Mouss. nord-ouest 81 (1873).

Dioicous; in lax fuscescent tufts, plants erect and decumbent, more or less flexuose, slender ½—1 in. high. Lower leaves more lax, longly lanceolate, upper densely crowded, from a longish ovate erect base, narrowly lanceolate-subulate, carinate, all patent and patulous when moist, subrecurved and arching upward, subcirrate when dry, at base

very concave and narrowly recurved at margin, thence with the margin erect or with one wing recurved, verruculose to the base, nerve of equal thickness, vanishing in the apex; cells at base minutely quadrate and rectangular, above very small and indistinct. Perich. bracts similar, but with longer concave base and thinner cells. Caps. on a long slender purple seta, elliptico-cylindric, pachydermous, rufous-brown, when dry and empty, exactly cylindric, slightly arcuate; lid conic, short beaked, a little incurved, concolorous with capsule, annulus of three rows of cells, peristome contorted, pale red, finally white, on a shortly papillose narrow basal membrane.

HAB.—On walls, especially in limestone districts. Fr. 4—5.

Sussex, Lancashire and Cheshire. Deepdale and Studley, Yorks. (*Baker* 1856)! Bolton Abbey (*Hunt* 1867)!! Wyndcliff, Aldrington beach and Cuckfield (*Davies* 1866)!! Levens (*Barnes* 1868). Den of Airlie and Auchinblae (*Hunt* 1869)!! Mucruss (*Schimper* 1865). Kilroot, Antrim (*Stewart* 1874). Plymouth (*Holmes* 1868)!!

Much resembling *B. fallax* in areolation, but known at once by the much longer and less recurved leaves, with smaller less incrassate cells; it must stand as the type of the species, being more highly developed in all its parts than *B. vinealis*.

VAR. *β.* **vinealis** (*Brid.*)

Plants shorter, rufo-ferruginous; leaves shorter. Caps. ovate-oblong with a shorter lid.

SYN.—*Barbula vinealis* BRID. Bry. univ. i, 830 (1827). Bry. eur. fasc. 13-15, p. 24, t. 10. RABENH. Deutsch. kr. fl. ii, S. 3, 107. C. MUELL. Synops. i, 617. MITT. Journ. Linn. soc. i, Suppl. 33. SCHIMP. Synops. 170, 2 ed. 209. HUSN. Mouss. nord-ouest 81, Musc. gall. 105, t. 29. MILDE Bry. siles. 118. JURATZ. Laubm. oesterr.-ung. 113. LESQ. JAMES Mosses N. Amer. 124.

Barbula fallax δ. vinealis HUEB. Musc. germ, 327.

Tortula fallax γ. vinealis DE NOT. Syllab. 180. Mem. acc. Torin. xl, 319.

Tortula vinealis SPRUCE in Lond. J. bot. iv, 194, et Ann. mag. n. h. 2 ser. iii, 378. DE NOT. Musc. ital. I, 60, t. 30. Epil. bri. ital. 554. BERK. Handb. Br. m. 257. LINDB. de Tort. 249; Bot. Not. 1865, p. 77. HOBK. Syn. br. m. 68.

HAB.—On walls; not uncommon.

Headington and Botley, Oxon (*Boswell* 1863)!! Patcham, Sussex (*Davies* 1868). Shere (*Capron* 1869). Saltash and Plymouth (*Holmes* 1867)!! Dunton Green (Holmes).

Resembling *B. fallax*, but the obscure small upper cells distinguish it; these in *fallax* being pellucid, rounded and much incrassate.

11. BARBULA SINUOSA (*Wils.*)

Dioicous; densely cæspitose. Leaves lineal-lanc., cirrate, nerved to apex, margin sinuous in the upper part, toothed at apex, basal cells rectangular. (T. XL, E.)

SYN.—*Dicranella sinuosa* WILS. MSS.

Trichostomum sinuosum Lindb.

Tortula sinuosa MITT. Journ. Bot. 1867, p. 327. BRAITHW. in SEEM. Journ. Bot. 1871, p. 294, t. 120, f. 6. HOBK. Syn. br. m. 73 (1873).

Didymodon sinuosus SCHIMP. Synops. 2 ed. 166 (1876).

Barbula cylindrica var. γ. *sinuosa* Lindb. Musc. scand. 22 (1879).

Dioicous; in small dense lurid green tufts, fuscous and radiculose below. Leaves dense, nearly straight, long lineal-lanc., from an oval concave base, acute, carinate above, fragile, cirrhate and twisted when dry, strongly verrucoso-papillose, nerved to apex, margin crenulate, more or less sinuose in upper half, flat or lightly recurved, inciso-dentate at apex; cells at base rectangular, pellucid, upper rounded quadrate, obscure. Perigynial bracts narrower, paler.

HAB.—On old walls, wet stones, and about tree roots, in calcareous districts.

Bangor (*Wilson* 1863)!! Woolsonbury hill (*Mitten*)!! Arundel and Wiston (*Davies* 1865)!! Plymouth and Laira Bridge (*Holmes* 1868)!! Cheedale (*Holmes* 1875). Phœnix Park, Dublin (*Hutton* 1865). Witney and Banbury (*Boswell* 1878)!! Monk's dale, Miller's dale and Monsal dale (*Holt* 1883)!! Buckingham (*Holmes*). Helmsley (*Wesley* 1877)!! Dunton Green, Kent (*Holmes*).

I have retained this as a species, although Juratzka, Lindberg, and others, regard it as only a variety of the last. The points of difference are the narrower longer fragile leaves, with the margin sinuous above, denticulate at apex, and recurved towards base.

12. **BARBULA HORNSCHUCHII** *Schultz.*

Dioicous; laxly cæspitose, slender. Leaves broadly lanc., very acute, nearly smooth, nerve stout, excurrent, margin revolute. Caps. elongate ovate, lid rostrate. (T. XLI, A.)

SYN.—*Barbula revoluta* (non BRID.) WEB. MOHR Bot. Tasch. 210 (1807). SCHULTZ Fl. starg. Suppl. 69 (1819).

Tortula revoluta (non SCHRAD.) HOOK. TAYL. Musc. br. 33, t. 12 (1818).

Barbula Hornschuchiana SCHULTZ Recens. Barb. et Syntr. 217, t. 33, f. 25 (1823). BR. SCHIMP. Bry. eur. fasc. 13-15, p. 28, t. 10 (1842), RABENH. Deutsch. kr. fl. ii, S. 3, 108 (1848). C. MUELL. Synops. i, 608 (1849). BERTOL. Fl. ital. cr. 208 (1858). SCHIMP. Synops. 173 (1860), 2 ed. 212. MILDE Bry. siles. 116 (1869). JURATZ. Laubm. oesterr.-ung. 116 (1882). HUSN. Mouss. nord-ouest 82 (1873), Musc. gall. 107, t. 30 (1886).

B. revoluta var. β. *Hornschuchiana* BRID. Bry. univ. i, 572 (1826).

T. revolut 1 var. β. *Hornschuchiana* DE NOT. in Mem. acc. Torin. xl, 315 (1838).

Tortula Hornschuchiana DE NOT. Syllab. 179 (1838), Musc. ital. I, 55, t. 27 (1862), Epil. bri. ital. 552 (1869). WILS. Bry. brit. 127, t. 43 (1885). HARTM. Skand. fl. 8 ed. 393 (1861). BERK. Handb. br. m. 256 (1863). LINDB. de Tort. 248 (1864). HOBK. Syn. br. m. 68 (1873).

Dioicous; slender, ½in. high, in lax dull green patches on the ground, stems dichotomous, fastigiate branched. Leaves erecto-patent, when dry incurved and often spirally imbricated, lanceolate, concavo-carinate, almost all the margin subrevolute, obsoletely papillose, mucronate with the excurrent nerve; cells at base rectangular, in the

middle roundish-quadrate, at apex elongated. Perich. bracts elongate-oblong, longly cuspidate, erect, sheathing, with plane margins, the nerve longly excurrent; seta red below, yellow above, caps. erect, from ovate narrowly oblong, subincurved, brown; lid red, long-beaked, ann. narrow, teeth purple, on a very narrow membrane, 2—3 times twisted. Male plant smaller, infl. gemmiform, bracts ovato-lanc., the nerve obsolete.

HAB.—On the ground and walls. Fr. 4—5.

Beaumaris and Aberffraw (*Wilson* 1830)!! Newton Viaduct (*Wilson* 1848)! Aldrington beach, Clayton and Balcombe (*Mitten*)! Henfield and Tunbridge wells (*Borrer* 1826)! Levens (*Barnes* 1868)! Coneysthorpe and Welburn, Yorks. (*Spruce* 1839)! Winwick quarry (*Hunt*). Noke, Oxford (*Boswell* 1860)!! Burnley (*Duerden* 1867)!! Cromford, Derby (*Hunt* 1863)!! Guildford and Shere (*Capron* 1868)!! Staddon heights (*Holmes* 1868)! Kirriemuir (*Fergusson*). Shirley, Warwick (*Bagnall*). Carrickfergus (*Moore*). Inchiquin (*Carroll*). Miller's dale (*Holt* 1886)!! Hincksey, Bucks. (*Boswell*).

13. **BARBULA REVOLUTA** (*Schrad.*) *Brid.*

Dioicous; compactly tufted. Leaves oblong-lanceolate, obtuse, mucronate with the thick excurrent nerve, margin strongly revolute. Caps. oval-oblong, lid subulate. (T. XLI, B.)

SYN.—*Bryum stellare nitidum pallidum, capsulis tenuissimis* DILL. Hist. musc. 381, t. 48, f. 44, (1741) et Herb.

Tortula revoluta SCHRAD. Syst. samml. kr. gew. i, n. 54 (1796), et in UST, neu ann. xiv. 109 (1796). BRID. Sp. musc. I, 262 (1806). GRAY Nat. arr. br. pl. i, 724 (1821), HOOK. Fl. scot. 127 (1821). HOOK. GREV. in BREWST. Edin. J. i, 290 p.p. (1824). MACK. Fl. hibern. P. 2, 25 (1836). DE NOT. in Mem. acc. Torin. xl, 314 (1838), Syllab. 178; Musc. ital. I, 54, t. 26 (1862), Epil. bri. ital. 550 (1869). SPRUCE Ann. mag. n. hist. 2 ser. iii, 377 (1849). WILS. Bry. br. 126, t. 12 (1855). BERK. Handb. br. m. 256 (1863). LINDB. De Tort. 248 (1864). HOBK. Syn. br. m. 67 (1873).

Barbula revoluta BRID. in SCHRAD. Journ. iii, P. II, 299 (1801), Mant. 95 (1819), Bry. univ. i, 571 (1826). WEB. MOHR Bot. Tasch. 210 (1807). SCHWAEG. Suppl. I, P. I, 127, t. 32 (1811). ROEHL. Deutsch. fl. iii, 79 (1813). SCHULTZ Recens. Barb. et Synt. 215, t. 33, f. 23 (1823). BR. SCHIMP. Bry. eur. fasc. 13-15, p. 27, t. 14 (1842). C. MUELL. Synops. i, 621 (1849). SCHIMP. Synops. 175 (1860), 2 ed. 213. MILDE Bry. siles. 114 (1869). HUSN. Mouss. nord-ouest 82 (1873), Musc. gall. 108, t. 30 (1886). JURATZ. Laubm. oesterr.-ung. 116 (1882).

Dioicous; in compact subpulvinate tufts, pale yellow-green or fuscescent. Leaves erecto-patent, when dry imbricated and contorted, small linear-ligulate, rather obtuse, the wings revolute, nerve thick, excurrent in a short mucro; cells at base rectangular, above roundish-quadrate, incrassate, papillose. Perich. bracts elongated, sheathing; seta red below, straw-coloured above, caps elliptic, regular, rufo-ferruginous, calyptra rather large, reaching middle of caps., annulus simple, lid conico-subulate, teeth from a broader basal membrane, very slender, purple, twice twisted. Male as in *B. Hornschuchii*.

HAB.—Limestone walls and the plaster of brick walls; not uncommon. Fr. 4. Lindberg states that this species is not found in Scandinavia, but another closely allied occurs in Sweden, which he names *B. obtusula*, more robust, the leaves broader, with a thicker nerve and shorter apiculus.

Sect. 4. LEPTOPOGON (*Mitt.*). Plants dwarf. Leaves yellowish green, short, rather obtuse; perich. bracts diverse, exserted, convolute. Caps. on a long seta; peristome very long, contorted.

14. BARBULA CONVOLUTA *Hedw.*

Dioicous; cæspitose, very slender. Leaves small, erecto-patent, ovato-lanceolate, the margin a little reflexed below. Perich. bracts convolute, sheathing. Caps. on a long yellow seta, narrowly oblong, lid rostrate. (T. XLI, C.)

SYN.—*Muscus minimus pallidus, foliis angustissimis acutis, corniculis tenuissimis* RAY Synops. 2 ed. 30, n. 9 (1696), p.p.

Bryum setaceum HUDS. Fl. angl. 409 (1762). NECK. Meth. 212 (1771). LIGHTF. Fl. scot. ii, 729 (1777). VILL. Pl. Dauph. iii, 880 (1786).

Mnium setaceum (non L.) POLLICH Pl. palat. iii, 54 (1777). EHRH. Hann. mag. 1780, p. 235.

Barbula setacea HEDW. Fund. II, 92 (1782), Stirp. cr. i, t. 32 (1787).

Barbula convoluta HEDW. Stirp. cr. i, 86, t. 32 (1787), Sp. musc. 120 (1801). TIMM Fl. meg. 240 (1788). BRID. Musc. rec. II, P. I, 205 (1798), Mant. 94 (1819), Bry. univ. i, 569 (1826). ROEHL. Moosg. deutsch. 433 (1800), Deutsch. fl. iii, 80 (1813). SCHULTZ Fl. Starg. 305 (1806), Rec. Barb. et. Syntr. 213, t. 33, f. 22 (1823). WEB. MOHR Bot. Tasch. 212 (1807). SCHWAEG. Suppl. I, P. I, 127 (1811). VOIT Musc. herb. 96 (1812). WAHLENB. Fl. lapp. 318 (1812). MART. Fl. cr. erl. 90 (1817). FUNCK Moost. 22, t. 15 (1821). BR. SCH. Bry. eur. fasc. 13-15, p. 29, t. 16 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 109 (1848). C. MUELL. Synops. i, 614 (1849). BERTOL. Fl. ital. cr. 208 (1858). SCHIMP. Synops. 175 (1860), 2 ed. 214. MILDE Bry. siles. 115 (1869). HUSN. Mouss. nord-ouest 83 (1873), Musc. gall. 108, t. 30. (1886). JURATZ. Laubm. oesterr.-ung. 118 (1882). LESQ. JAMES Mosses N. Amer. 127 (1884).

Bryum convolutum DICKS. Pl. cr. fasc. II, 6 (1790). RELH. Fl. cant. Suppl. 9 (1793). WITH. Bot. arr. Br. Veg. 3 ed. iii, 816 (1796). ABBOT Fl. bedf. 37 (1798). HULL Br. fl. P. II, 254 (1799).

Tortula convoluta SCHRAD. Spic. fl. germ. 66 (1794). SIBTH. Fl. Oxon. 285 (1794). SWARTZ Musc. suec. 41 (1799). ROTH Fl. germ. iii, P. I, 208 (1800). SMITH Fl. brit. iii, 1253 (1804), Eng. Bot. t. 2382. TURN. Musc. hib. 49 (1804). BRID. Sp. musc. I, 261 (1806). HOOK. TAYL. Musc. brit. 33, t. 12 (1818). GRAY Nat. arr. br. pl. i, 725 (1821). HOOK Fl. scot. 128 (1821), Br. Fl. ii, 44 (1833). DE NOT. in Mem. acc. Torin, xl, 314 (1838), Syllab. 178, Musc. ital. I, 53, t. 25 (1862), Epil. bri. ital. 551 (1869). WILS. Bry. br. 127, t. 12 (1855). LINDB. De Tort. 248 (1864). HOBK. Syn. br. m. 67 (1873). BERK. Handb. br. m. 255 (1863).

Streblotrichum convolutum P. BEAUV. Prodr. 89 (1805), et in Mem. Soc. Linn. Par. i, t. 5, f. 6 (1822).

Dioicous; flat, densely cæspitose, pale yellow green above, fuscous below. Leaves erecto-patent, somewhat recurved, crisped when dry, lower ovato-lanc., upper narrowly ligulato-lanc., rather obtuse or sometimes pointed, margin plane, subrecurved towards base, nerve vanishing at or below the point; cells at base pellucid, elongate rectangular, above small quadrate and obscure with chlorophyl, finely papillose. Perich. bracts closely sheathing, exserted, inner convolute, obtuse or shortly apiculate, yellowish, nerveless; caps. on a long slender yellow seta, narrowly oblong, incurved, rufous bay coloured; annulus rolling back, lid conico-subulate; per. long, purple, closely twisted in many

convolutions. Male plant more slender, infl. gemmiform, bracts ovato-lanceolate.

HAB.—Bare places among short grass and on limestone walls; not uncommon. Fr. 4—5.

Var. β. **Sardoa** *Br. Sch.*

Tufts very dense, taller; leaves longer, somewhat recurved, dull green, more pointed; caps. elongated.

SYN.—*Barbula convoluta* β. *Sardoa* BR. SCH. Bry. eur. l. c. C. MUELL. Synops. 615.

Tortula convoluta β *Sardoa* WILS. Bry. brit. 128.

Barbula convoluta var. *densa* MILDE Bry. siles. 116.

Barbula commutata JURATZ. Verh. k. k. zool.-bot. Ges. in Wien 1874, p. 377. LAUBM. oesterr.-ung. 119 (1882).

Trichostomum undatum SCHIMP. Synops. 2 ed. 180.

HAB.—Banks in limestone districts.

Luttrelstown, Dublin (*Taylor*). Glendalough (*Palgrave* 1866)!! Beddgelert (*Wilson* 1854)!! Bangor (*Wilson* 1863)!! Lennox Castle (*Mc. Kinlay*)! Seven Churches, Wicklow (*Lindberg* 1873)!! Old walls at Wytham, Oxford (*Boswell*, 1881)!!

Sect. 5. HELICOPOGON (*Mitt.*) Leaves obtuse, deep green, the perichætial bracts but little different; caps. erect; peristome elongated, contorted.

15. **BARBULA UNGUICULATA** (*Huds.*) *Hedw.*

Dioicous; laxly cæspitose. Leaves erecto-patent, ovato-lanceolate, rather obtuse, mucronate with the excurrent nerve, margin revolute below, upper cells opake. Caps. oblongo-cylindric. (T. XLI, D.)

SYN.—*Muscus trichoides minor vulgaris facie, foliis capillaceis* MERR. Pinax n. 88 (1667). RAY Synops. 2 ed. App. 324 (1696).

Bryum angustis viridibus foliis, capitulis erectis brevibus, pediculis insidentibus, calyptra falcata vel avium unguiculas referente DILL. Cat. Giss. 225 (1719), in RAY Syn. 3 ed. 96 (1724).

Bryum unguiculatum et barbatum, surculis in summitate crassioribus DILL. Hist. musc. 383, t. 48, f. 47 (1741) et Herb.

Bryum unguiculatum et barbutum, tenuius et stellatum DILL. op. c. 384, t. 48, f. 48, et Herb.

Bryum unguiculatum HUDS. Fl. angl. 410 (1762). L. Mant. ii, 309 (1771). SCHREB. Spic. fl. lips. 78 (1771). WITH. Bot. arr. brit. veg. ii, 262 (1776). EHRH. Hann. Mag. 1780, p. 236. RELH. Fl. cant. Suppl. 10 (1793). ABBOT Fl. bedf. 242 (1798). SWARTZ Meth. 29 (1781).

Barbula unguiculata HEDW. Fund. II, 92 (1782), Stirp. i, 59, t. 23 (1787), Sp. musc. 118 (1801). BRID. Musc. rec. ii, P. I, 118 (1798), Mant. 94 (1819), Bry. univ. i, 563 (1826). ROEHL. Moosg. deutsch. 415 (1800), Deutsch. fl. iii, 79 (1813). SCHULTZ Fl. starg. 304 (1806), Rec. Barb. et Syntr. 204, t. 32, f. 12 (1823). WEB. MOHR Bot. Tasch. 208 (1807). SCHWAEG. Suppl. I, P. I, 123 (1811). VOIT Musc. herb. 54 (1812). MART. Fl. cr. erl. 89 (1817). FUNCK Moost. 22, t. 15 (1821). HUEBEN. Musc. germ. 323 (1833). BR. SCHIMP. Bry. eur. fasc. 13-15, p. 19, t. 5 & 6 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 105 (1848). C. MUELL. Synops. i, 612 (1849). SCHIMP. Synops. 167 (1860), 2 ed. 203. MILDE Bry. siles. 121 (1869). HUSN. Mouss. nord-ouest 80 (1873), Musc. gall. 104, t. 29 (1886). JURATZ. Laubm. oesterr.-ung, 109 (1882). LESQ. JAMES Mosses N. Amer. 120 (1884).

Mollia unguiculata SCHRANK Bayers fl. ii, 457 (1789).

Bryum mucronulatum DICKS. Pl. crypt. Fasc. III, 3 (1793). HOFFM. Deutsch. fl. ii, 44 (1795).

Bryum linoides DICKS. op. c. 8, t. 8, f. 3.

Tortula mucronulata SWARTZ Musc. suec. 40 (1799). SM. Fl. brit. iii, 1250 (1804), Eng. Bot. t. 1299. TURN. Musc. hib. 47 (1804).

Tortula unguiculata ROTH Fl. germ. iii, P. I, 206 (1800). P. BEAUV. Prodr. 93 (1805), in Mem. soc. Linn. t. 6, f. 1 (1822). BRID. Sp. musc. I, 258 (1806). HOOK. TAYL. Musc. brit. 33, t. 12 (1818). HOOK. Fl. scot. P. 2, 128 (1821). GRAY Nat. arr. br. pl. i, 724 (1821). HOOK. GREV. in BREWST. Ed. J. i, 294 (1824). ARN. in Mem. soc. d'hist. nat. Paris ii, 286 (1825). MACK. Fl. hib. P. 2, 26 (1836). DE NOT. Syllab. 177 (1838), Musc. ital. I, 49, t. 23 (1862), Epil. bri. ital. 548 (1869). WILS. Bry. brit. 21, t. 12 (1855). BERK. Handb. br. m. 258 (1863). LINDB. De Tort. 241 (1864). HOBK. Syn. br. m. 67 (1873).

Tortula humilis (non HOOK. GREV.) TURN. Musc. hib. 45 (1804), Eng. bot. t. 1663.

Dioicous; in broad lax tufts, dull yellow green above, fuscescent below, with few radicles. Leaves erecto-patent, when dry appressed and somewhat twisted, narrowly ovato- and oblongo-lanceolate, more or less obtuse, mucronate with the thick yellowish excurrent nerve, margin revolute in the lower half, carinate at apex; cells at base small rectangular pellucid, above quadrate, opake, densely papillose. Perich. bracts elongate, subvaginant, inner narrower, hyaline to apex, nerve excurrent; caps. on a purple seta, rufo-fuscous, leptodermous, elongate-elliptic or subcylindric, regular or slightly incurved, lid conico-subulate, ann. none, peristome deep red, 2—3 twisted. Male plant more slender, infl. terminal gemmaceous, bracts broadly ovato-lanceolate.

HAB.—Banks and hedge-rows in clay soil; common. Fr. 12-2.

Var. *β.* **cuspidata** (*Schultz*).

Stem short, leaves linear-oblong, narrower, cuspidate with the excurrent nerve, nearly straight.

SYN.—*Barbula cuspidata* SCHULTZ Suppl. fl. starg. 68. Rec. Barb. t. 32, f. 14 a.
Barbula lanceolata HEDW. Sp. musc. t. 26.
Bryum ericetorum DICKS. Pl. crypt. Fasc. II, 5?
Tortula ericetorum SM. Eng. Bot. t. 2495?

HAB.—Gravelly banks.

Var. *γ.* **apiculata** (*Hedw.*).

Leaves recurvo-patulous, the apex obtuse, tipped with the excurrent nerve.

SYN.—*Barbula apiculata* HEDW. Sp. musc. 117, t. 26, f. 1-4. SCHULTZ Rec. t. 33, f. 17. BRID. Mant. 94. Bry. univ. i, 560.
Tortula apiculata TURN. Musc. hib. 46. Eng. Bot. t. 2494.
Tortula aristata SM. Fl. brit. 1261. Eng. Bot. t. 2393.
Bryum aristatum DICKS. Fasc. IV, 12, t. 11, f. 7.
Barbula aristata BRID. Mant. 92.
Tortula barbata SM. Eng. Bot. t. 2391. Fl. brit. 1260.

HAB.—Walls at Croydon (*Dickson*). Dublin (*Stokes*). Plymouth (*Holmes*)!! Dromore, Down (*Rev. C. H. Waddell*)!! Otford, Kent (*Holmes*).

Var. δ. **microcarpa** (*Schultz*).

More slender; leaves more crowded, shorter, patenti-recurved, caps. small, oval, lid conico-subulate.

SYN.—*Barbula microcarpa* SCHULTZ Rec. t. 33, f. 18. BRID. Bry. univ. i, 561.

HAB.—Baugh Fell, Yorks. (*West*, 1879)!!

Var. ε. **obtusifolia** (*Schultz*).

More robust; leaves crowded, shorter, broader, obtuse, very shortly mucronate or muticous; caps. narrowed, oblongo-cylindric.

SYN.—*Barbula obtusifolia* BRID. Mant. 90. SCHULTZ Rec. t. 32, f. 13.

HAB.—Roadside banks. Miller's dale (*Holt*, 1882)!!

Var. ϑ. **fastigiata** (*Schultz*).

Taller, repeatedly fastigiate branched; leaves broader, softer, subundulate at margin.

SYN.—*Barbula fastigiata* SCHULTZ Rec. t. 33, f. 15. BRID. Bry. univ. i, 554.

HAB.—Shore of L. Neagh, Ardmore, Armagh (*Rev. H. W. Lett* 1885)!!

A plant of wide distribution, and as usual with such, subject to considerable variation; it may however be generally recognized by the obtuse apiculate leaves with recurved margins, and thin-walled oblong capsule without any annulus. In its very slender fragile peristome it resembles *B. fallax*.

16. **BARBULA MUCRONATA** *Brid.*

This was misplaced under *Tortula* at p. 218, its most natural position is here next to *B. unguiculata*, and indeed it clearly forms a connecting link between that species and *Cinclidotus*.

ADDENDUM TO TORTULA § ZYGOTRICHIA.

TORTULA SUBERECTA *Drumm.*

Autoicous; stems short, nearly simple. Leaves papillose, ovato-lanceolate, the margin revolute, nerve excurrent in a subula. Caps. cylindraceous, oblique, lid conico-rostellate; peristome on a short basal membrane. (T. XLI, E.)

SYN.—*Tortula suberecta* DRUMM. Musc. amer. n. 145 (1828).

Desmatodon obliquus BR. SCHIMP. Bry. eur. fasc. 18-20, p. 10, t. 7 (1843). SCHIMP. Synops. 161 (1860), 2 ed. 187. DE NOT. Epil. bri. ital. 575 (1869). JURATZ. Laubm. oesterr.-ung. 132 (1882). LESQ. JAMES Mosses N. Amer. 115 (1884). HUSN. Musc. gall. 94, t. 26 (1885).

Trichostomum obliquum C. MUELL. Synops. i, 594 (1849).

Autoicous; cæspitose, lurid green, stem short, almost simple. Leaves flaccid, erecto-patent, lower ovate-oblong, upper broadly ovato-lanceolate, the margin revolute, except at the faintly toothed apex, nerve excurrent in a piliform arista; cells at base rectangular, hyaline, above hexagonal, chlorophyllose, densely papillose, the marginal more transparent and forming a yellowish border. Caps. on a slender purple seta, cylindraceous, inclined and usually curved, fuscescent, finally reddish brown; annulus simple, lid conico-rostellate; peristome a short pale basal tube, the teeth red, fragile, scabrous, obliquate. Male infl. at base of female, bracts 1—3, thin, aristate.

HAB.—Wet crevices of alpine rocks. Fr. 7—8.

The Rev. J. Fergusson informs me that this species certainly occurs in Scotland, but as he has not favoured me with specimens, I have made the drawing from a Norwegian one.

It deviates from our other species of this section by the shortness of the tubular base of peristome, but stands next to another Norwegian species, *T. Laureri* (SCHULTZ), and also comes near to *T.* (*Desmatodon*) *latifolia* (HEDW.) and *T. systylia* (BR. SCH.).

Subf. 2. CINCLIDOTEÆ.—Tall aquatic mosses, forming black-green mats, fasciculate-branched. Leaves solid, strong-nerved. Caps. immersed, at end of primary shoots. Per. a cancellated basal membrane, with filiform processes cohering at base by trabeculæ.

CINCLIDOTUS. P. BEAUV.

Prodr. p. 28 (1805).

Cladocarpous, fixed to stones and floating in water. Leaves solid, strong-nerved, bordered. Fruit terminating the primary branches, immersed; calyptra conico-cucullate; peristome on a cancellated membrane, of 16 teeth, each divided into 2—3 slender filiform legs. Der. κιγκλιδωτος latticed.

I have preferred this name to the older one, *Sekra* of Adanson, as apart from its barbarous sound, the character assigned to it would not be sufficient to identify it; the Linnean specific name also is in relation to *Fontinalis antipyretica*, with which the present has no affinity.

CINCLIDOTUS FONTINALOIDES (*Hed.*) *P. Beauv.*

Dioicous; in olive green fasciculate floating tufts. Leaves elongate-lanceolate, patulous. Caps. immersed, ovate-oblong; peristome filiform, twisting to the right. (T. XLI, F.)

SYN.—*Fontinalis minor, foliis triangularibus minus complicatis, capitulis in summis ramulis sessilibus* DILL. in RAY Synops. 3 ed. 79 (1724).

Fontinalis triangularis minor carinata, e cymis capsulifera DILL. Hist. musc. 257, t. 33, f. 2 (1741), et Herbar.

Fontinalis minor L. Sp. pl. 1107 (1753). HUDS. Fl. angl. 398 (1762). WITH. Bot. arr. br. veg. ii, 692 (1776). LIGHTF. Fl. scot. ii, 695 (1777). WEBER Sp. fl. goett. 35 (1778). HEDW. Fund. II, 96 (1781). ROTH Fl. germ. i, 478 (1788). ABBOT Fl. bedf. 231 (1798). HULL Br. fl. P. 2, 275 (1799). SM. Eng. Bot. t. 557.

Fontinalis alpina DICKS. Pl. crypt. fasc. II, 2, t. 4, f. 1 (1790).

Hypnum fontinaloides LAMARCK Enc. meth. iii, 164 (1789).

Trichostomum fontinaloides HEDW. Stirp. cr. iii, 36, t. 14 (1792), Sp. musc. 114. BRID. Musc. rec. II, P. I, 133 (1798), Sp. Musc. I, 243 (1806). SWARTZ Musc. suec. 30 (1799). ROEHL. Moosg. deutsch. 277 (1800). SM. Fl. brit. 1248 (1804). TURN. Musc. hib. 41 (1804). WEB. MOHR Bot. Tasch. 121 (1807). SCHKUHR Deutsch. kr. gew. P. II, 75, t. 34 (1810). SCHWAEG. Suppl. I, P. I, 160 (1811).

Cinclidotus fontinaloides P. BEAUV. Prodr. 52 (1805). HOOK. TAYL. Musc. brit. 29, t. 11 (1818). FUNCK Moost. 24, t. 16 (1821). BRID. Bry. univ. i, 229 (1827). HARTM. Skand. fl. GRAY Nat. arr. br. pl. i, 722 (1821). HOOK. Fl. Scot. P. 2, 127 (1821), Br. fl. ii, 47 (1833). HUEBEN. Musc. germ. 216 (1833). MACK. Fl. hib. P. 2, 27 (1836). DE NOT. Syll. 259 (1838), Epil. bri. ital. 492 (1869). BR. SCH. Bry. eur. fasc. 16, Mon. 9, t. 2 (1842). RABENH. Deutsch. kr. fl. ii, S. 3, 242 (1848). WILS. Bry. brit. 139, t. 11 (1855). SCHIMP. Synops. 195 (1860), 2 ed. 236. BERK. Handb. br. m. 249, t. 22, f. 2 (1863). MILDE Bry. siles. 140 (1869). HOBK. Syn. br. m. 74 (1873). HUSN. Mouss. nord-ouest 88 (1873), Musc. gall. 120, t. 34 (1886). JURATZ. Laubm. oesterr.-ung. 147 (1882). LESQ. JAMES Mosses N. Amer. 134 (1884).

Trematodon fontinaloides ROEHL. Deutsch. fl. 2 ed. iii, 65 (1813).

Rhacomitrium fontinaloides BRID. Mant. 80 (1819).

Guembelia fontinaloides C. MUELL. Synops. ii, 652 (1851).

Cinclidotus minor LINDB. De Tort. 255 (1864).

Sekra minor (L.) LINDB. Musc. scand. 23 (1879).

Dioicous; stems 3—8 in. long, crowded in soft olive-green fasciculate tufts, rooting on stones and floating, the lower part setulose with the persistent nerves of abraded leaves. Leaves elongato-lanc., decurrent, obtuse or very shortly apiculate, unequal, subflexuose, patulous or slightly secund, twisted when dry, subcarinate, slightly toothed at apex, border thick rounded subterete, nerve thick, plane above, prominent at back, excurrent in a mucro; basal cells small rectangular, upper hexagonal opake. Fertile branches short, suberect, often secund, fruit immersed, lower perich. bracts oblong-ovate, upper oblong, attenuate, subacute, the nerve vanishing. Calyptra conico-cucullate, chartaceous; caps. ovate-oblong, leptodermous, sulcate when dry, fuscous; lid conic, slightly curved, half length of capsule; peristome purple, twisting to the right, teeth from a narrow cancellated basal membrane, 16, each separating into 2—3 filiform legs, anastomosing at base and adhering to the exserted apex of columella. Male plants more slender, the infl. gemmiform, collected into small clusters, bracts broadly ovate, concave, shortly acuminate.

HAB.—Attached to stones or wood in streams, especially in limestone districts; not uncommon. Fr. 4—5.

This genus stands between Tortulaceæ and Grimmiaceæ, and is usually associated with the latter, but both in peristome and leaf-structure, its affinity is clearly strongest with the former.

In Mr. Hunt's herbarium is a specimen of *C. aquaticus*, with the label "Mourne mountains, Co. Down, Ireland, with *C. fontinaloides*," but as no recent collectors have met with it, I have not figured it, although it is a species quite likely to occur; it may be readily distinguished by the leaves, which are narrowly linear-lanceolate and falcato-secund.

Subf. 3. LEERSIEÆ. Plants growing in small tufts on the ground or on rocks. Leaves spathulate, basal cells fragile, hyaline, foraminate, upper with verruciform papillæ. Calyptra large, cylindric, rostrate. Capsule cylindric; peristome none, single or double.

LEERSIA *Hedw.*

Fund. musc. II, 88 (1782).

Plants cæspitulose, dichotomous. Leaves lingulate or spathulate, the basal cells rectang. fragile, hyaline, foraminate, the upper chlorophyllose, papillose. Calyptra enclosing the whole caps., cylindric with a styliform beak; caps. cylindraceous, erect on a tall seta; per. none, simple of 16 teeth or double. Inhabiting the ground and rocks.—Named in honour of John Daniel Leers of Herborn in Nassau.

The fine mosses which constitute this genus are readily known by their large tubular calyptra, which is very persistent, and in falling takes the lid with it. The large opake leaves are not unlike those of *Tortula subulata*, &c., but are generally rufous at base, and their upper cells are protuberant and provided with large papillæ, cleft at top into several heads. The vaginula is oblong and generally crowned with an ochrea or saucer-shaped membrane originating in the base of the calyptra, which in the young state is inflexed, and when older and torn off, is entire, or lacerate, or fringed with ramentaceous processes. The peristome when present consists of red, slender teeth composed of 1—4 series of cells, and the endostome of pairs of cilia, concrete above, joined at base to a thin punctulate membrane adherent at the lower part to the teeth of the peristome.

Schreber in 1791 superseded Hedwig's name by that of *Encalypta* and *Leersia* was again used in 1788 by Swartz—adopting a MSS. name of Solander's—for a genus of grasses which had already in 1776 been named *Homalocenchrus* by Mieg in Pollich's Hist. Plant. in Palatinatu; it is clear therefore that the original name *Leersia* must be retained for the genus of mosses. About 25 species are described.

CLAVIS TO THE SPECIES.

Capsule smooth or faintly striolate.	
Calyptra not fringed at mouth, peristome none.	
Calyptra smooth at apex.	*alpina.*
——— scabrous at apex.	*exstinctoria.*
Calyptra fringed at mouth, peristome present.	*laciniata.*
Capsule sulcato-striate.	
Plants short; striæ vertical.	*rhabdocarpa.*
——— tall; striæ twisted spirally.	*contorta.*

Sect. 1. PSILOTHECA *C. Muell.* Capsule smooth or faintly striolate.

1. LEERSIA ALPINA (*Smith*) *Lindb.*

Autoicous; dichotomously branched. Leaves erecto-patent, subsquarrose, ovato-lanceolate, acuminate, nerve excurrent in a long point. Caps. gymnostomous; beak of calyptra glabrous. (T. XLII, A.)

SYN.—*Encalypta intermedia* FROELICH MSS. in herb. Wulfen.

Encalypta alpina SMITH Eng. Bot. t. 1419 (1805). WAHLEN. Fl. lapp. 312 (1812), Fl. carpat. 335 (1814), Fl. suec. 2 ed. ii, 790 (1833) excl. syn. LINDB. in Act. soc. sc. fenn. x, 269 (1872).

Encalypta affinis (non HEDW.) SCHWAEG. Suppl. I, P. I, 58, t. 16 (1811). ROEHL. Deutsch. fl. iii, 53 (1813). FUNCK Moost. 12, t. 7 (1821). BRID. Bry. univ. i, 143 (1826).

Encalypta ciliata β. *alpina* HOOK. TAYL. Musc. brit. 35 (1818). HOOK. Fl. scot. 128 (1821).

Encalypta ciliata β. *pilifera* HOOK. TAYL. Musc. br. 2 ed. 63 (1827). Br. flora ii, 18 (1833).

Encalypta commutata NEES HORNSCH. Bry. germ. ii, P. I, 46, t. 15, f. 4 (1827). HUEBEN. Musc. germ. 100 (1833). BR. SCHIMP. Bry. eur. fasc. 4, p. 8, t. 1 (1839). RABENH. Deutsch. kr. fl. ii, S. 3, 170 (1848). C. MUELL. Synops. i, 513 (1849). WILS. Bry. brit. 141, t. 44 (1849). SCHIMP. Synops. 285 (1860), 2 ed. 340. BERK. Handb. br. m. 246 (1863). DE NOT. Epil. bri. ital. 325 (1869). MILDE Bry. siles. 181 (1869). HOBK. Syn. br. m. 74 (1873). JURATZ. Laubm. oesterr.-ung. 213 (1882). LESQ. JAMES Mosses N. Amer. 180 (1884).

Encalypta lacera DE NOT. Syllab. 268 (1838). C. MUELL. Synops. i, 514 (1849).

E. caucasica RUPR. in Bull. soc. imp. de nat. Mosc. 1846, p. 521. C. MUELL. Synops. i, 522.

Leersia alpina LINDB. Musc. scand. 20 (1879).

Autoicous; in dull yellow-green tufts, 1 in. high, dichotomously branched, radiculose. Lower leaves ovato-lanc., upper from an erect sheathing base, erecto-patent and subsquarrose, elongated, acuminate, cuspidate with the excurrent nerve, subundulate above the base, flat at margin; cells at base lax rufous, the marginal narrow and linear, forming a yellowish limb, above small, opake, but little incrassate, papillose. Perich. bracts shorter, ovate; seta longish, twisted to the right above, purple, vaginula thick, ovoid; cal. reaching below capsule, glossy, fuscescent, with a smooth spadiceous point, irregularly torn at the paler base; caps. ovato-cylindraceous, straight or curving, fuscous, smooth, glossy, faintly striolate, stomata at base numerous, annulus narrow, the narrow mouth girt by a thin horizontal membrane, peristome none, lid conic, longly rostrate. Male infl. gemmiform, terminal on short lateral branches, bracts ovato-lanc. apiculate, nerved.

HAB.—Crevices of mountain rocks; rare. Fr. 7—8.

Ben Lawers (*Hooker* and *Greville*)!! Craigailleach (*Wilson*)! Ingleborough (*Hooker*). Ben Ledi (*Holmes* 1880)!

Var. β. **imberbis** *Lindb.*

Plants tall, densely tufted; leaves with the apex subcucullate from the incurved margins, and the nerve vanishing at the rather obtuse point. (T. XLII, B, δ.)

HAB.—Ben Laoigh, Perthshire (*Holt*, July, 1880) ! !

This species is best distinguished by the smaller dense cells in the upper part of the leaf, which is also more acuminate than in any of our other species.

2. LEERSIA EXSTINCTORIA (*L.*) *Leyss.*

Autoicous; short, radiculose. Leaves oblong-lanc., obtuse or apiculate with the excurren. nerve. Caps. cylindric, smooth; calyptra pale, entire at base, scabrous at apex; per. none or pale and very fugacious. (T. XLII, B.)

SYN.—*Muscus trichoides minor pileis magnis acutis* MERR. Pinax 89 (1667). RAY Synops. 2 ed. 324 (1696).

Adiantum aureum perpusillum foliis congestis acutis, pileolo extinctorii figura RAY Synops. 2 ed. 32, n. 24.

Bryum erectis capitulis, calyptra laxa conica, foliis serpylli pellucidi angustioribus DILL. Cat. Giss. 223 (1719), in RAY Synops. 3 ed. 92 (1724).

Bryum calyptra exstinctorii figura, minus DILL. Hist. musc. 349, t. 45, f. 8 (1741) et Herbar.

Bryum exstinctorium L. Sp. pl. 1116 (1753); Syst. nat. ii, 701. HUDS. Fl. angl. 405 (1762). WEISS Cr. goett. 185 (1770). NECK. Meth. musc. 207 (1771). WITH. Bot. arr. br. veg. ii, 672 (1776). LIGHTF. Fl. scot. ii, 718 (1777). WEB. Spic. fl. goett. 98 (1778). RELH. Fl. cant. 402 (1785). SM. Eng. bot. t. 558. Fl. dan. t. 1001. ABBOT Fl. bedf. 239 (1798). HULL Br. fl. P. 2, 258 (1799).

Leersia vulgaris HEDW. Fund. II, 88 (1782), Musc. frond. i, 46, t. 18 (1787). ROTH Fl. germ. i, 455 (1788). TIMM Fl. meg. n. 730 (1788). SCHRANK Baiers fl. ii, 443 (1789). BRID. Musc. rec. II, P. I, 51 (1798).

Leersia exstinctoria LEYSSER Fl. hal. n. 1053 (1783). BROCKM. Beitr. kr. fl. Mekl. 23 (1863).

Mnium exstinctorium SWARTZ Meth. musc. 365 (1787).

Encalypta exstinctoria SWARTZ Musc. suec. 24 (1799). HARTM. Skand fl. WAHLENB. Fl. upsal. 385 (1820). BROCKM. Laubm. Mekl. 90 (1869).

Encalypta vulgaris HEDW. Sp. musc. t. 60 (1801). SM. Fl. brit. iii, 1180 (1804). TURN. musc. hib. 17 (1804). ROEHL. Moosg. deutsch. 89 (1800), Deutsch. fl. iii, 52 (1813), Ann. Wett. ges. iii, 115. P. BEAUV. Prodr. 56 (1805). SCHULTZ Fl. starg. 281 (1806). WEB. MOHR Bot. Tasch. 106 (1807). BRID. Sp. musc. I, 88 (1806), Mant. 28 (1819), Bry. univ. i, 139 (1826). SCHWAEG. Suppl. I, P. I, 56 (1811). VOIT Musc. herb. 20 (1812). WAHLEN. Fl. lapp. 311 (1812), Fl. carp. 335 (1814). MART. Fl. cr. erl. 115 (1817). HOOK. TAYL. Musc. br. 35, t. 13 (1818). GRAY Nat. arr. br. pl. i, 725 (1821). HOOK. Fl. scot. P. 2, 128 (1821), Br. fl. ii, 18 (1833). FUNCK Moost. 11, t. 7 (1821). NEES HORNSCH. Bry germ. ii, P. I, 32, t. 14, f. 1 (1827). HUEBEN. Musc. germ. 98 (1833). MACK. Fl. hib. P. 2, 13 (1836). BR. SCHIMP. Bry. eur. fasc. 4, p. 9, t. 2 (1839). DE NOT. Syll. 269 (1838), Epil. bri. ital. 324 (1869). RABENH. Deutsch. kr. fl. ii, S. 3, 169 (1848). C. MUELL. Synops. i, 516 (1849). WILS. Bry. br. 142, t. 13 (1855). SCHIMP. Synops. 286 (1860), 2 ed. 341. BERK. Handb. br. m. 246, t. 22, f. 1 (1863). MILDE Bry. siles 181 (1869). HOBK. Syn. br. m. 75 (1873). HUSN. Mouss. nord-ouest 111 (1873). JURATZ. Laubm. oesterr.-ung. 214 (1882). LESQ. JAMES Mosses N. Amer. 181 (1884).

Encalypta Orsinii DE NOT. Syllab. 267 (1838).

Encalypta leptodon Var. *exstinctoria* LINDB. in Act. soc. sc. fenn. X, 268 (1872).

Autoicous; densely tufted, radiculose at base, dark green, with short thick branches. Leaves erecto-patent, when dry incurved and subcomplicate, lingulate, apiculate or obtuse, subundulate, nerve strong, reddish, vanishing at or below apex or excurrent; cells at mid-base more laxly rectangular, very thin, at margin narrow and yellowish.

Perich. bracts ovato-lanceolate; vaginula somewhat contracted at middle. Calyptra reaching neck of caps., thin, pale yellow-green, equal or lacerate at base, scabrous at apex; caps. on a red seta, ovato-cylindric, leptodermous, when dry and empty cylindric and faintly striate, pale yellowish brown, orange at neck and mouth; ann. simple, red, lid straight with a subulate beak; per. none or with pale truncate very fugacious teeth; spores large, papillose. Male infl. gemmaceous, axillar, bracts ovate, convolute, acuminate, the nerve obsolete.

HAB.—Walls covered with earth, banks and rocks; not uncommon. Fr. 3—5.

VAR. β. **pilifera** (*Funck*).

Plants shorter, leaves narrower with the nerve excurrent in a pale yellowish hair.

SYN.—*Encalypta pilifera* FUNCK Crypt. gew. fasc. 26, n. 527, Flora i, 255, Moostasch. 12, t. 7. BRID. Bry. univ. i, 141. STURM Deutsch. fl. cr. 2, 17.

Enc. vulgaris var. *pilfera* HUEB. Musc. germ. 99.

HAB.—Youlgreave and Buxton (*Wilson*).

Var. γ. **obtusifolia** (*Funck.*)

Stem erect, branched; leaves dilated at base, obtuse, the nerve vanishing.

SYN.—*Encalypta obtusifolia* FUNCK. BRID. Bry. univ. i, 766.

Enc. vulgaris var. *obtusa* NEES HORNSCH. Bry. germ. ii, P. I, 35. HUEB. Musc. germ. 98. SCHIMP.

Enc. vulgaris var. *mutica* BRID. Bry. univ. i, 141.

HAB.—Youlgreave and Rhuddlan Castle, N. Wales (*Wilson*)!

The peristome in this moss is very thin and fragile and is thus probably destroyed by adhesion to the lid, for its presence is extremely rare. The dull paper-like calyptras are the first objects to direct attention to this species, which is more or less generally distributed, but never occurs in great quantity.

3. LEERSIA LACINIATA *Hedw.*

Autoicous; branched; leaves oblong-ligulate, patulous, shortly acuminate, margin revolute below middle, nerve excurrent. Caps. subcylindric, smooth; calyptra with the base contracted and bordered with cuneate laciniæ, nearly smooth at apex. (T. XLII, C.)

SYN.—*Bryum erectis longis et obtusis capitulis, calyptra laxa conica, foliis serpylli pellucidi latioribus* DILL. Cat. Giss. 223 (1719).

Bryum calyptra extinctorii figura, majus et ramosum DILL. Hist. musc. 350, t. 45, f. 9 (1741) et Herbar.

Bryum exstinctorium var. β. L. Sp. pl. 1116(1753). HUDS. Fl. angl. 405 (1762). WEISS Cr. goett. 187 (1770). NECK. Meth. musc. 207 1771). WITH. Bot. arr. br. veg. ii, 672 (1776). LIGHTF. Fl. scot. ii, 719 (1777). WEB. Spic. fl. goett. 99 (1778). HULL Br. fl. 258 (1799).

Leersia laciniata HEDW. Fund. II, 103 (1782).

Leersia ciliata HEDW. Musc. frond. i, 49, t. 19 (1787). EHRH. Pl. crypt. n. 123. SCHRANK Bayers. fl. ii, 443 (1789).

Leersia fimbriata BRID. Musc. rec. II, P. I, 53 (1798).

Encalypta ciliata HOFFM. Deutsch. fl. ii, 27 (1795). SWARTZ Musc. suec. 25 (1799). ROTH Fl. germ. iii, P. I, 153 (1800). ROEHL. Moosg. deutsch. 104 (1800), Deutsch. fl. iii, 53 (1813). Ann. Wett. ges. ii, 115. HEDW. Sp. musc. 61 (1801). SM. fl. brit. iii, 1181 (1804), Eng. Bot. t. 1418. TURN. Musc. hib. 18 (1804). Fl. dan. t. 1416. WEB. MOHR Bot. Tasch. 107 (1807). SCHKUHR Deutsch. kr. gew. P. 2, 45, t. 19 (1810). SCHWAEG. Suppl. I, P. I, 59 (1811). VOIT Musc. herb. 19 (1812). WAHLENB. Fl. lapp. 311 (1812), Fl. carpat. 335 (1814), Fl. Upsal. 386 (1820). HOOK. TAYL. Musc. brit. 35, t. 13 (1818). FUNCK Moost. 12, t. 7 (1821). HOOK. Fl. scot. P. 2, 128 (1821), Br. fl. ii, 18 (1833). GRAY Nat. arr. br. pl. i, 726 (1821). NEES HORNSCH. Bry. germ. ii, P. I, 59, t. 15, f. 8 (1827). HARTM. Skand. fl. HUEBN. Musc. germ. 106 (1833). DE NOT. Syllab. 266 (1838), Epil. bri. ital. 322 (1869). BRUCH SCHIMP. Bry. eur. fasc. 4, p. 10, t. 3 (1839). RABENH. Deutsch. kr. fl. ii, S. 3, 170 (1848). C. MUELL. Synops. i, 517 (1849). WILS. Bry. br. 143, t. 13 (1855). SCHIMP. Synops. 288 (1860), 2 ed. 343. BERK. Handb. br. m. 247 (1863). MILDE Bry. siles. 183 (1869). HOBK. syn. br. m. 75 (1873). HUSN. Mouss. nord-ouest 111 (1873). JURATZ. Laubm. oesterr.-ung. 217 (1882). LESQ. JAMES Mosses N. Amer. 182 (1884).

Bryum ciliare GMEL. Syst. nat. ii, 1332 (1791). DICKS. Cr. Fasc. IV, 15 (1801).

Encalypta fimbriata BRID. Sp. musc. I, 89 (1806), Mant. 30 (1819), Bry. univ. i, 145 (1826). ROEHL. Deutsch. fl. iii, 53.

Encalypta clausa WALLR. Fl. cr. germ. i, 125 (1831).

Encalypta laciniata LINDB. in Act. soc. sc. fenn. X, 269 (1872).

Autoicous; in small lax pale green tufts, with short dichotomous innovations. Leaves soft, erecto-patent, when dry complicate and circinato-incurved, broadly oblong-ligulate, carinate-concave, subundulate at margin and revolute at middle, strongly verruculose; nerve strong, pale yellow, excurrent in a soft mucro or vanishing below the pale apiculus, cells above coarse, rounded, at base lax, pellucid, rufous, scarcely limbate. Inner perich. bracts thin, broadly ovate, nerved, about as long as the oblong vaginula with its tubular ochrea. Calyptra pale straw-coloured, prolonged below the caps., the base contracted and encircled by short cuneate laciniæ, connivent when dry, patent when moist, the apex smooth or slightly papillose. Caps. on a yellow or red seta, oblongo-cylindraceous, at first yellow, finally rufo-fuscous, smooth, when dry slightly contracted below mouth, annulus indistinct, lid conico-subulate, shorter than caps., peristome arising below orifice, small, of 16 narrowly lanceolate red punctate teeth, sometimes irregular, when dry horizontally closing the capsule, patent when moist; spores large, smooth. Male infl. gemmiform, in the axils of the comal leaves, bracts thin, ovate, apiculate.

HAB.—On rocks in subalpine districts, not common. Fr. 6—7.

Ben Lawers and Craig Ailleach (*Hooker*) ! ! Teesdale (*Spruce*) ! ! Ingleboro and Malham Tarn (*Nowell* 1854) ! Snowdon (*Wilson*). Loughrigg Fell, Rydal (*Wood* 1864) ! Rannoch (*B. White* 1867) ! Mardale (*Barnes* 1869) ! Langdon beck (*Stabler* 1868) ! Canlochan (*Hunt* 1868) ! ! Whernside (*Lees and West* 1878) ! Ben Aught, Clova (*Howse*) ! !

Sect. 2. RHABDOTHECA. C. Muell. Capsule strongly sulcato-striate.

4. LEERSIA RHABDOCARPA (*Schwaegr.*) *Lindb.*

Autoicous; densely cæspitose. Leaves oblongo-lanc., rather acute nerve vanishing or excurrent. Caps. sub-cylindric, with 8—16 erect striæ; cal. scabrous at apex, per. of 16 lanceolate teeth. (T. XLII, D.)

SYN.—*Leersia vulgaris β. alpina* BRID. musc. rec. II, P. I, 53 (1798).

Encalypta rhaptocarpa SCHWAEG. Suppl. I, P. I, 56, t. 16 (1811). ROEHL. Deutsch. fl. iii, 53 (1813). FUNCK Moost. 12, t. 7 (1821). GREV. Scott. cr. fl. t. 163 (1825). BRID. Mant. 29 (1819), Bry. univ. i, 142 (1826). HOOK. TAYL. Musc. br. 2 ed. 64, T. Suppl. 2, (1827). NEES HORNSCH. Bry. germ. ii, P. I, 38, t. 14, f. 2 (1827). HUEBEN. Musc. germ. 102 (1833). MACK. Fl. hib. P. 2, 13 (1836). DE NOT. Syll. 265 (1838), Epil. bri. ital. 323 (1869). BR. SCHIMP. Bry. eur. fasc. 4, p. 13, t. 6 (1839). RABENH. Deutsch. kr. fl. ii, S. 3, 171 (1848). C. MUELL. Synops. i, 520 (1849). WILS. Bry. br. 144, t. 32 (1855). SCHIMP. Synops. 287 (1860), 2 ed. 342. BERK. Handb. br. m. 247 (1863). MILDE Bry. siles. 182 (1869). LINDB. in Act. soc. sc. fenn. 268 (1872). HOBK. Syn. br. m. 75 (1873). JURATZ. Laubm. oesterr.-ung. 215 (1882). LESQ. JAMES Mosses N. Amer. 181 (1884).

Encalypta ciliata γ. rhaptocarpa HOOK. TAYL. Musc. br. 36 (1818). GRAY Nat. arr. br. pl. i, 726 (1821).

Leersia rhabdocarpa LINDB. musc. scand. 20 (1879).

Autoicous; densely tufted and radiculose, resembling *L. exstinctoria*. Leaves when wet erecto-patent, when dry somewhat twisting, ovato and oblongo-lanceolate or ligulate, concave at base, flattish, nerve rufescent, vanishing at apex or excurrent in a mucro or yellowish hair, upper margin crenulate with papillose cells, basal lax, hyaline or rufescent, very narrow at margin. Inner perich. bracts shorter, oblong, aristate; vaginula short, expanded at apex like a plate; calyptra straw-coloured, sublacerate at base, scabrous at apex; caps. narrowly ovate or sub-cylindric, pale fuscous with 8—16 rufous erect striæ, when dry deeply sulcate, with a hemispherical hypophysis; annulus simple, lid convex, subulate, shorter than caps.; teeth lanceolate, remotely articulate, entire or perforated; spores green, verruculose. Male infl. lateral, bracts ovate, shortly acuminate.

HAB.—On the ground and crevices of rocks in alpine districts. Fr. 7—8.

Ben Bulben, Sligo (*Mackay*). Ben Lawers and Craigailleach (*Greville*). Ingleboro (*Nowell* 1857)!! Largo Links (*Howie* 1864)!! Ptarmigan m. (*Rogers* 1876).

At first sight much resembling *L. exstinctoria*, but easily separated by the longitudinally striate capsule, and presence of a peristome.

5. LEERSIA CONTORTA (*Wulf.*) *Lindb.*

Dioicous; tall, densely tufted. Leaves lingulate, obtuse, nerve scabrous at back, vanishing at apex, cells strongly papillose. Caps. cylindric, deeply spirally 8-sulcate; cal. scabrous at apex; per. double, outer of 16 subulate teeth, inner of shorter cilia. (T. XLII, E.)

SYN.—*Hypnum saxatile erectum, ramulis teretibus, foliis subrotundis saturate viridibus* DILL. Cat. Giss. 220 (1719), Hist. musc. 335, t. 43, f. 71 (1741) et Herbar.

Bryum contortum WULF. in JACQ. Coll. ii, 236, excl. syn. Dill. (1788).

Encalypta grandis SWARTZ in SCHRAD. Journ. ii, 172 (1799).

Encalypta streptocarpa HEDW. Sp. musc. 62, t. 10, f. 10—18 (1801). SM. Fl. brit. iii, 1182 (1804), Eng. Bot. t. 2163. BRID. Sp. musc. I, 89 (1806), Mant. 30 (1819), Bry. univ. i, 144 (1826). WEB. MOHR Bot. Tasch. 107 (1807). SCHKUHR Deutsch. kr. gew. P. II, 45, t. 29 (1810). SCHWAEG. Suppl. I, P. I, 59 (1811). VOIT Musc. Herb. 18 (1812). WAHLENB. Fl. carp. 335 (1814). ROEHL. Deutsch. fl. iii, 53 (1813), Ann. Wett. ges. iii, 116. MART. Fl. cr. erl. 115 (1817). HOOK. TAYL. Musc. br. 34, t. 13 (1818). SCHULTZ Suppl. fl. starg. 66 (1819). FUNCK Moostasch. 12, t. 8 (1821). HOOK. Fl. scot. P. II, 128 (1821), Br. fl. ii, 18 (1833). HARTM. Skand. fl. 386. GRAY Nat. arr. br. pl. i, 725 (1821). WALK. ARN. Disp. meth. 23 (1825). NEES HORNSCH. Bry. germ. ii, P. I, 55, t. 15, f. 7 (1827). HUEBEN. Musc. germ. 107 (1833). MACK. Fl. hib. P. 2, 13 (1836). DE NOT. Syll. 264 (1838), Epil. bri. ital. 321 (1869). BR. SCHIMP. Bry. eur. fasc. 4, 15, t. 7 (1839). RABENH. Deutsch. kr. fl. ii. S. 3, 172 (1848). C. MUELL. Synops. i, 521 (1849). WILS. Bry. br. 145, t. 13 (1855). SCHIMP. Synops. 292 (1860), 2 ed. 347. BERK. Handb. br. m. 247 (1863). MILDE Bry. siles. 183 (1869). HOBK. Syn. br. m. 76 (1873). HUSN. Mouss nord-ouest 112 (1873). LESQ. JAMES Mosses N. Amer. 183 (1884).

Encalypta contorta HOPPE Bot. Taschenb. BROCKM. Laubm. Mekl. 91 (1869). LINDB. in Act. soc. sc. fenn. X, 268 (1872). JURATZ. Laubm. oesterr.-ung. 219 (1882).

Leersia streptocarpa BROCKMÜLLER Beitr. kr. fl. Mekl. 23 (1863).

Leersia contorta LINDB. Musc. scand. 19 (1879).

Dioicous; in large coarse tufts, deep green above, fuscous and densely radiculose below, the young shoots light green. Leaves patulous, when dry laxly incumbent and incurved, from a clasping diaphanous base, limbate with narrow cells, oblongo-lingulate, muticous, the wings sometimes incurved at apex and subcucullate, the cells coarsely rotundate and strongly papillose; nerve rufous, prolonged to apex, scabrous at back. Perich. bracts from an oblong concave base, suddenly acuminate, convolute, erect. Calyptra very long, narrow, cylindraceous, fuscescent, fimbriato-lacerate at mouth, very rough at apex; caps. on a tall red seta, long, from ovate cylindraceous, obliquely or sub-spirally orange-striate, when dry, cylindric, spirally 8—sulcate; lid clavellate, orange, half length of caps.; annulus broad, double, rolling back; teeth of per. half length of caps., purple, filiform, erect, remotely nodulose, minutely papillose; endostome one half shorter than peristome, of 32 yellowish filiform cilia in pairs, united to the middle to a punctulate membrane closely applied to the teeth; spores very small, green, smooth. Male plant less robust, infl. terminal gemmiform, bracts broadly ovate, subacuminate.

HAB.—Rocks, walls and gravelly banks, especially on limestone. Fr. 8.

Not uncommon but very rarely fertile; c. fr. Youlgreave, Derby (*Bowman*). Matlock (*Wilson*). Bolton Bridge (*Nowell*)!! Wall of a bridge at Blair Atholl. Bridge by Ossian's hall, Dunkeld (*Hooker* 1815)!! Near Lough Bray (*Mackay*). Jackdaw crag quarry, Tadcaster (*Wesley* 1878)!!

The largest of our species and easily recognized by its coarse rigid leaves, opake with stout papillæ. It is extremely abundant at Pitlochry, but is seldom seen in fruit in this country.

TAB. XXVII. A. *Ephemerum serratum* (Sydenham, *George*). B. *Eph. minutissimum* (Hurst, *Mitten*). C. *Eph. intermedium* (Hurst, *Mitten*). D. *Eph. cohærens* (Ireland, *Moore*). E. *Eph. stenophyllun* and β. var. *brevifolium* (Mere, *Wilson*). F. *Eph. recurvifolium* Sussex, *Davies*). G. *Acaulon triquetrum* (Sussex, *Davies*). H. *Ac. muticum* and β. var. *minus* (Sussex, *Davies*). I. *Phascum acaulon* (Croydon, *Braithwaite*), β. var. *piliferum*; γ. var. *elatum*; δ. var *curvisetum*. K. *Phasc. Floerkei* and β. var. *badium* (Sussex, *Davies*).

TAB. XXVIII. A. *Phascum curvicolle* (Plymouth, *Holmes*). B. *Pottia recta* (Levens, *Barnes*) C. *P. bryoides* (Levens, *Barnes*), and β. var. *Thornhillii*. D. *P. Heimii* (Shoreham, *Braithwaite*). E. *P. truncatula* (Chiselhurst, *Braithwaite*). F. *P. intermedia* (Cheshire, *Wilson*). G. *P. litoralis* (Sussex, *Mitten*).

TAB. XXIX. A. *Pottia lanceolata* (Gravesend, *Braithwaite*). B. *P. cæspitosa* (Arundel, *Davies*). C. *P. Starkei* (Sussex, *Davies*), β. var. *affinis*, γ. var. *Davallii*. D. *P. asperula* (Penzance, *Curnow*). E. *P. viridifolia* (Plymouth, *Holmes*). F. *P. Wilson.* (Penzance, *Curnow*).

TAB. XXX. A. *Pottia crinita* (Aberdeen, *Dickie*). B. *P. latifolia* (Clova, *Fergusson*). C. *Tortula pusilla* (Cheshire, *Wilson*). D. *T. lamellata* (Oxford, *Boswell*). E. *T. brevirostris* (Ashwood Dale, *George*). F. *T. stellata* (Oxford, *Boswell*). G. *T. ericæfolia* (Oxford, *Boswell*).

TAB. XXXI. A. *Tortula aloides* (Oxford, *Boswell*). B. *T. atrovirens* (Barmouth, *Holt*). C. *T. cuneifolia* (Plymouth, *Holmes*). D. *T. Vahlii* (Sussex, *Davies*). E. *T. marginata* (Shere, *Capron*). F. *T. canescens* (Sussex, *Jenner*). G. *T. muralis* (Croydon, *Braithwaite*), β. var. *rupestris*, γ. var. *æstiva*.

TAB. XXXII. A. *Barbula mucronata* (Surrey, *Braithwaite*). B. *Tort. subulata* (Whitby, *Braithwaite*). C. *T. angustata* (York, *Spruce*). D. *T. mutica* (Sussex, *Davies*). E. *T. papillosa* (Sussex, Davies). F. *T. lævipila* (Epsom, *George*).

TAB. XXXIII. A. *Tortula montana* (Conway, *Wilson*). B. *T. ruralis* (Kent, *Holmes*). C. *T. princeps* (Kirriemuir, *Fergusson*). D. *Pleurochæte squarrosa* (Plymouth, *Holmes*). E. *Mollia crispa* (Betchworth, *Braithwaite*). F. *M. multicapsularis* (Appleton, *Wilson*). G. *M. Mittenii* (Hurst, *Mitten*).

TAB. XXXIV. A. *Mollia rostellata* (Sussex, *Davies*). B. *M. microstoma* (Gravesend, *Braithwaite*), β. var. *obliqua*. C. *M. squarrosa* (Cheshire, *Wilson*). D. *M. condensa* (Plymouth, *Holmes*). E. *M. viridula* (Kent, *Braithwaite*), β. var. *amblyodon*. F. *M. rutilans* (Sussex, *Davies*). G. *M. tenuis* (Ashley, *Hunt*).

TAB. XXXV. A. *Mollia calcarea* (Monsal-dale, *Holt*), β. var. *Viridula*. B. *M. æruginosa* (Ben Lawers, *Braithwaite*). C. *M. verticillata* (Bangor, *Wilson*). D. *M. crispula* (Ormeshead, *Wilson*), β. var. *viridula*, γ. var. *elata*, δ. var. *nigro-viride*. E. *M. litoralis* (Penzance, *Curnow*).

TAB. XXXVI. A. *Mollia brahcydontia* (Bristol, *Wilson*), β. var. *cophocarpa*. B. *M. tenuirostris* (Dolgelly, *Wilson*). β. var. *Daldinii*, γ. var. *Holtii*. C. *M. hibernica* (Killarney, *Holt*). D. *M. flavovirens* (Penzance, *Curnow*).

TAB. XXXVII. A. *Mollia nitida* (Plymouth, *Holmes*). B. *M. inclinata* (Oxford, *Boswell*). C. *M. tortuosa* (Killarney, *Holt*), β. var. *dicranoidea*, γ. var. *angustifolia*, δ. var. *fragilifolia*. D. *M. fragilis* (Ben Laoigh, *Ewing*). E. *Leptodont. flexifolium* (Witney, *Boswell*).

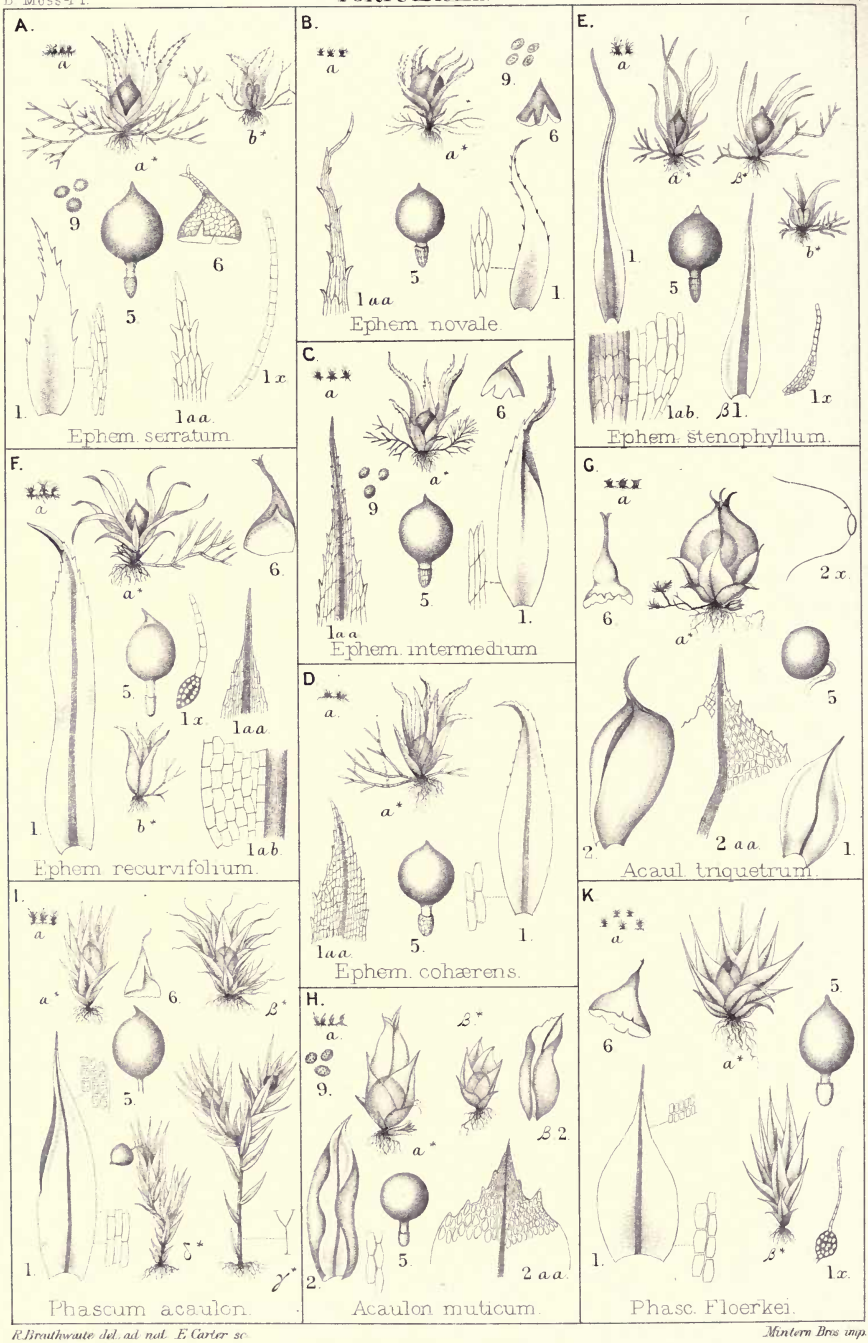
TAB. XXXVIII. A. *Leptod. gemmascens* (Hurst, *Mitten*). B. *L. recurvifolium* (Wales, *Holt*). C. *Mollia lutescens* (Glena, *Lindberg*). D. *Barbula curvirostris* (Wales, *Wilson*), and var. *commutata*.

TAB. XXXIX. A. *Barbula rubella* (Schiehallion, *Braithwaite*), β. var. *dentata*, γ. var. *ruberrima*. B. *B. lurida* (Wetherby, *Wesley*). C. *B. brevifolia* (Southport, *Hunt*). D. *B. fallax* (Eskdale, *Braithwaite*), β. var. *brevifolia*. E. *B. reflexa* (Malham, *West*) β. var. *robusta*.

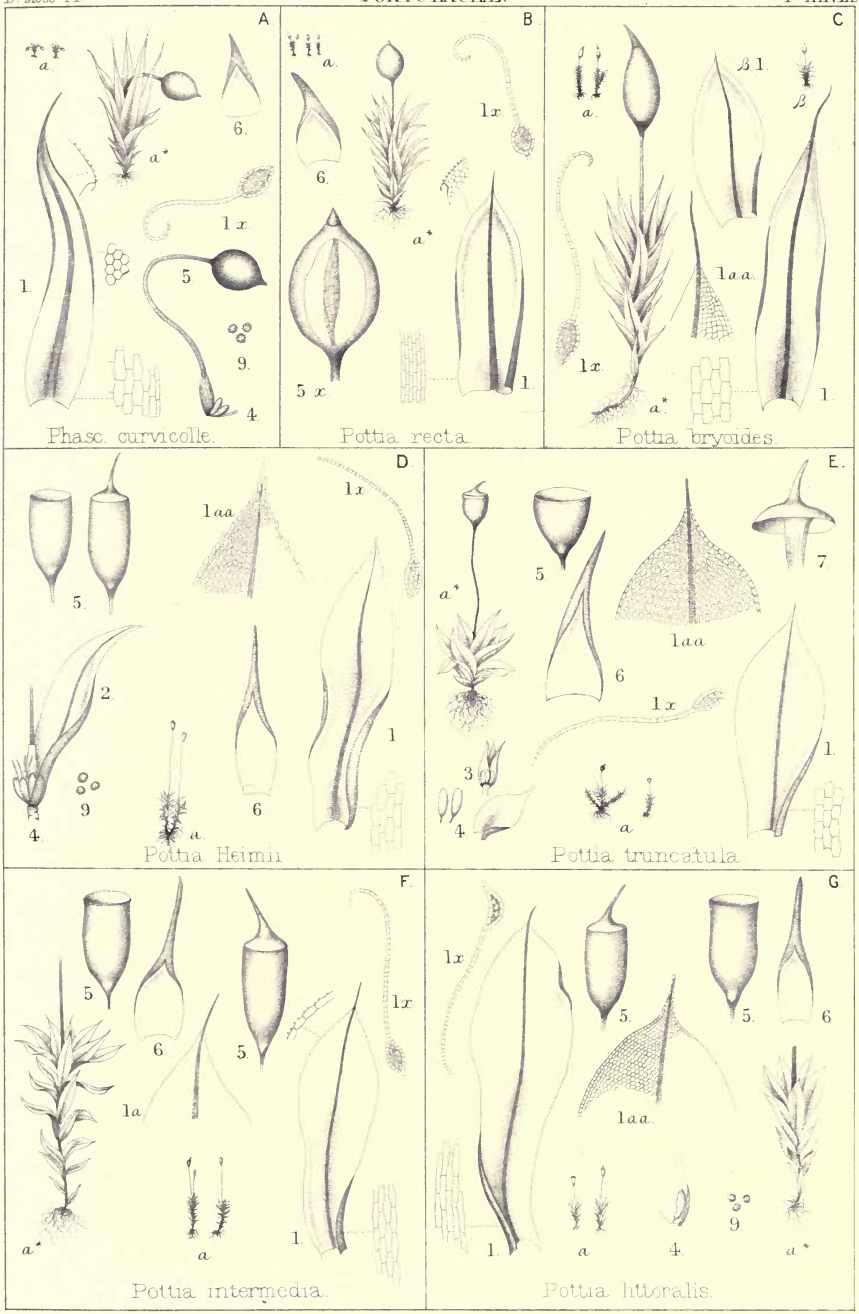
TAB. XL. A. *Barbula spadicea* (Bolton bridge, *Hunt*). B. *B. rigidula* (Cliviger, *Nowell*). C. *B. acuta* (Durdham Downs, *Thwaites*). D. *B. cylindrica* (Bolton, *Hunt*), β. var. *vinealis*. E. *B. sinuosa* (Bangor, *Wilson*).

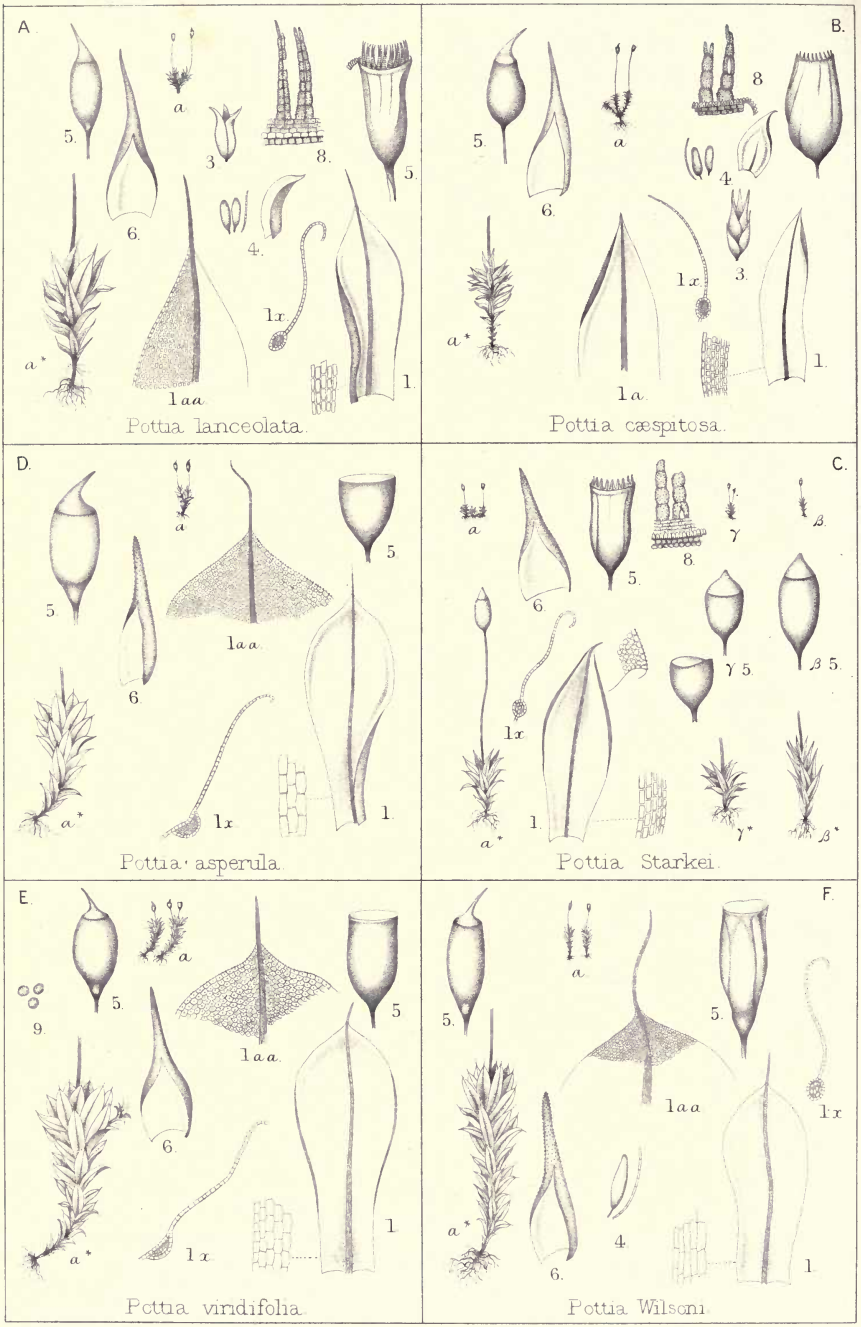
TAB. XLI. A. *Barbula Hornschuchii* (Oxford, *Boswell*). B. *B. revoluta* (Tring, *Braithwaite*). C. *B. convoluta* (Shirley, *Braithwaite*), β. var. *sardoa*. D. *B. unguiculata* (Abbey wood, *Braithwaite*). E. *Tortula suberecta* (Norway, *Kiaer*). F. *Cinclidotus fontinaloides* (Malham, *Braithwaite*).

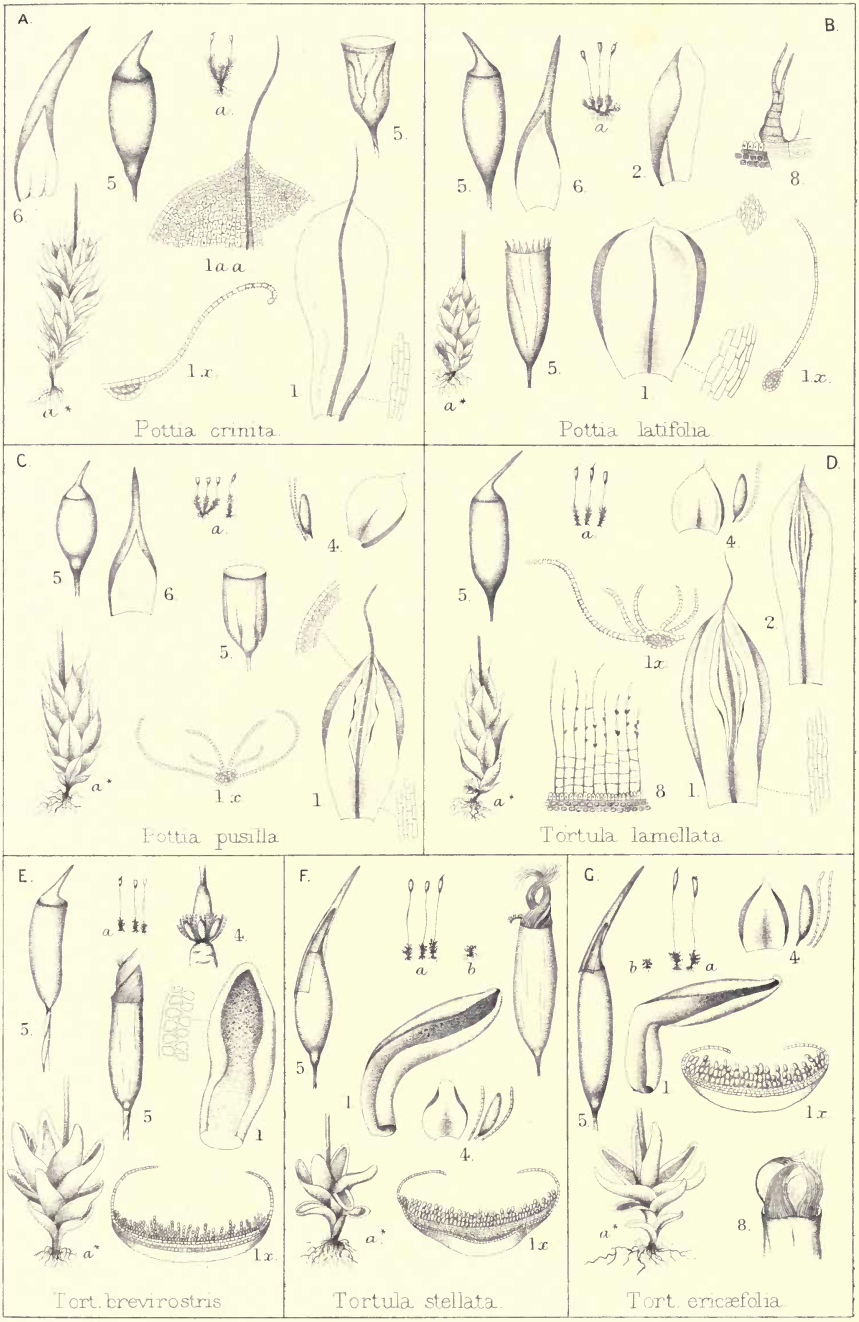
TAB. XLII. A. *Leersia alpina* (Ben Lawers, *Wilson*). B. *Leersia exstinctoria* (Addington, *Braithwaite*), β. var. *pilifera*, δ. *Leersia alpina* var. *imberbis* C. *L. laciniata* (Ben Lawers, *Braithwaite*). D. *L. rhabdocarpa* (Largo, *Howie*). E. *L. contorta* (Blair Atholl, *Wilson*).

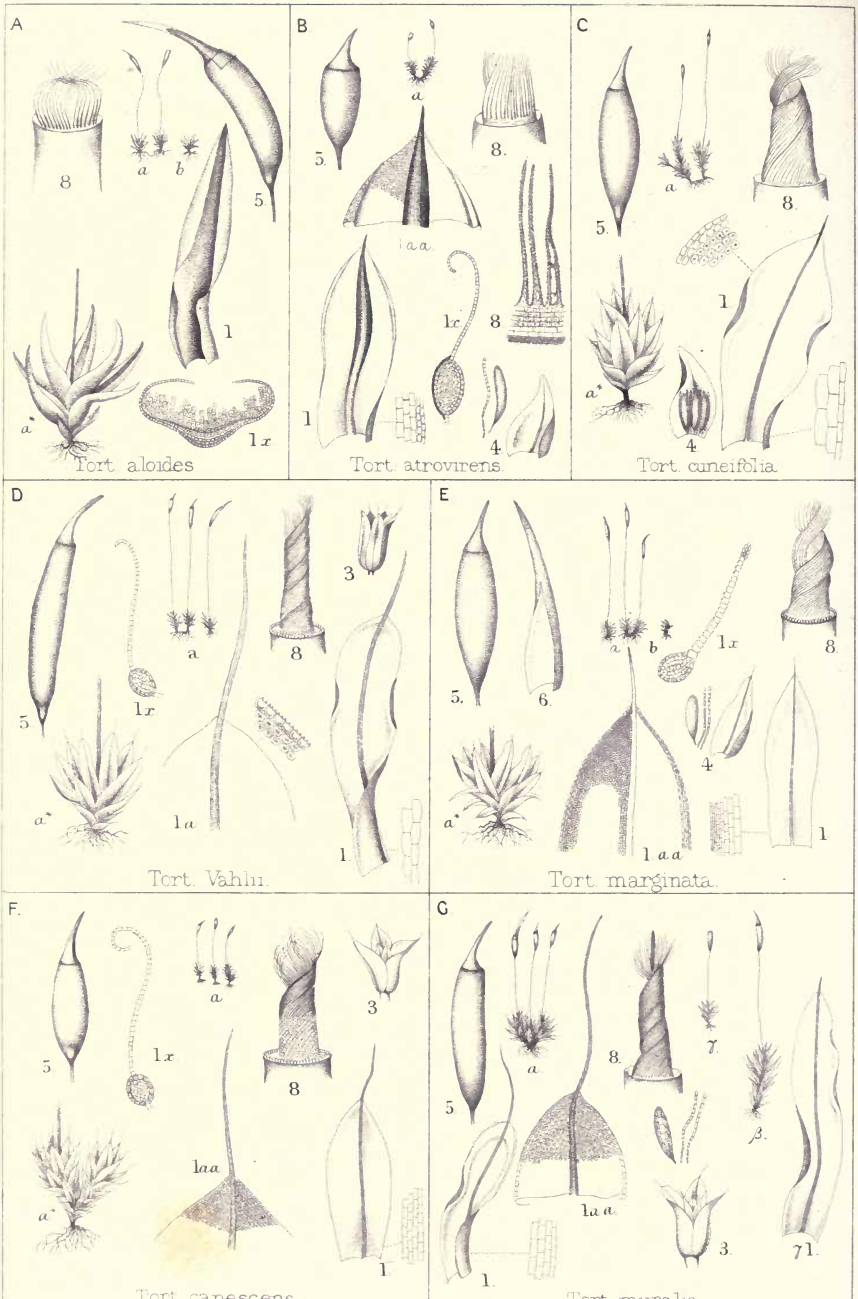


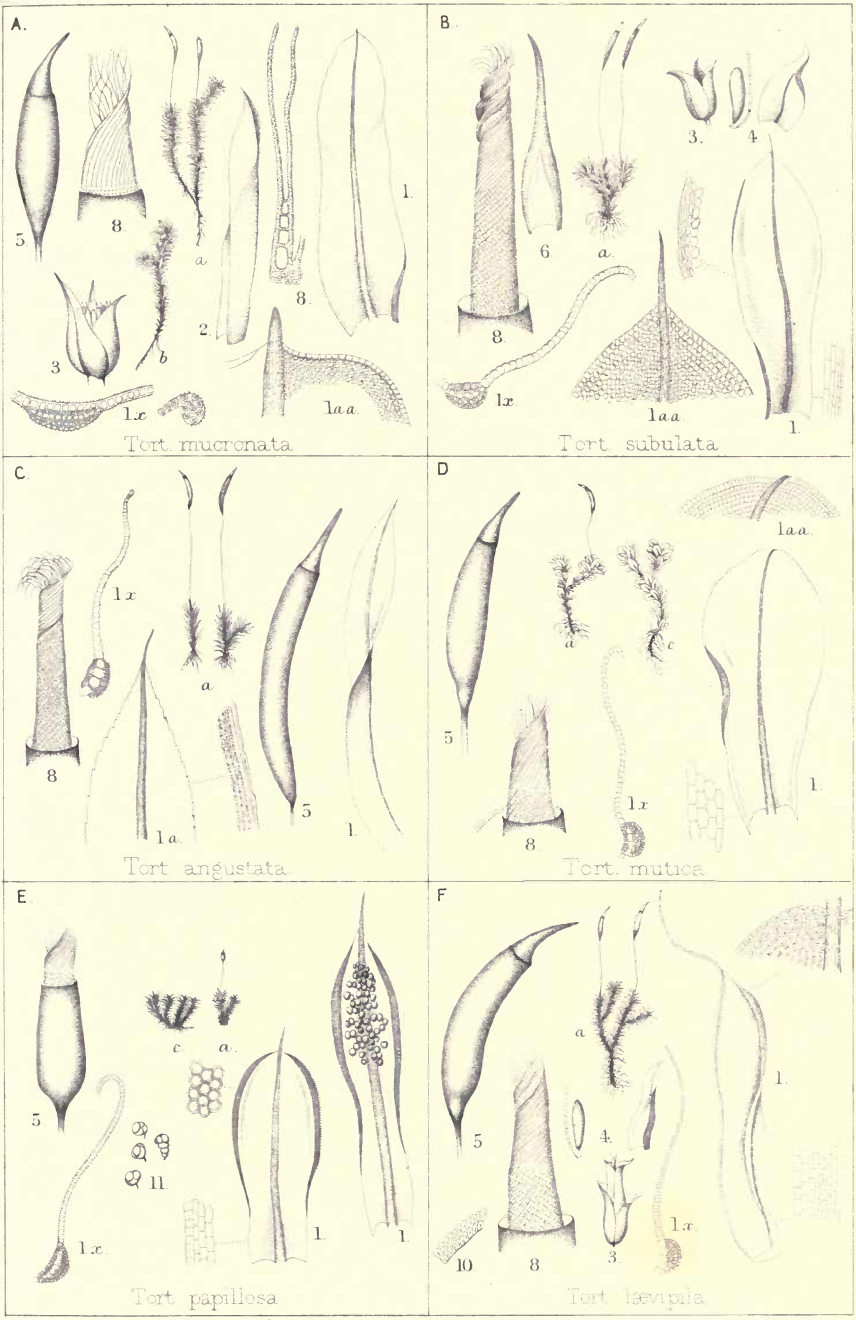
R. Braithwaite del. ad. nat. E. Carter sc. Mintern Bros imp.

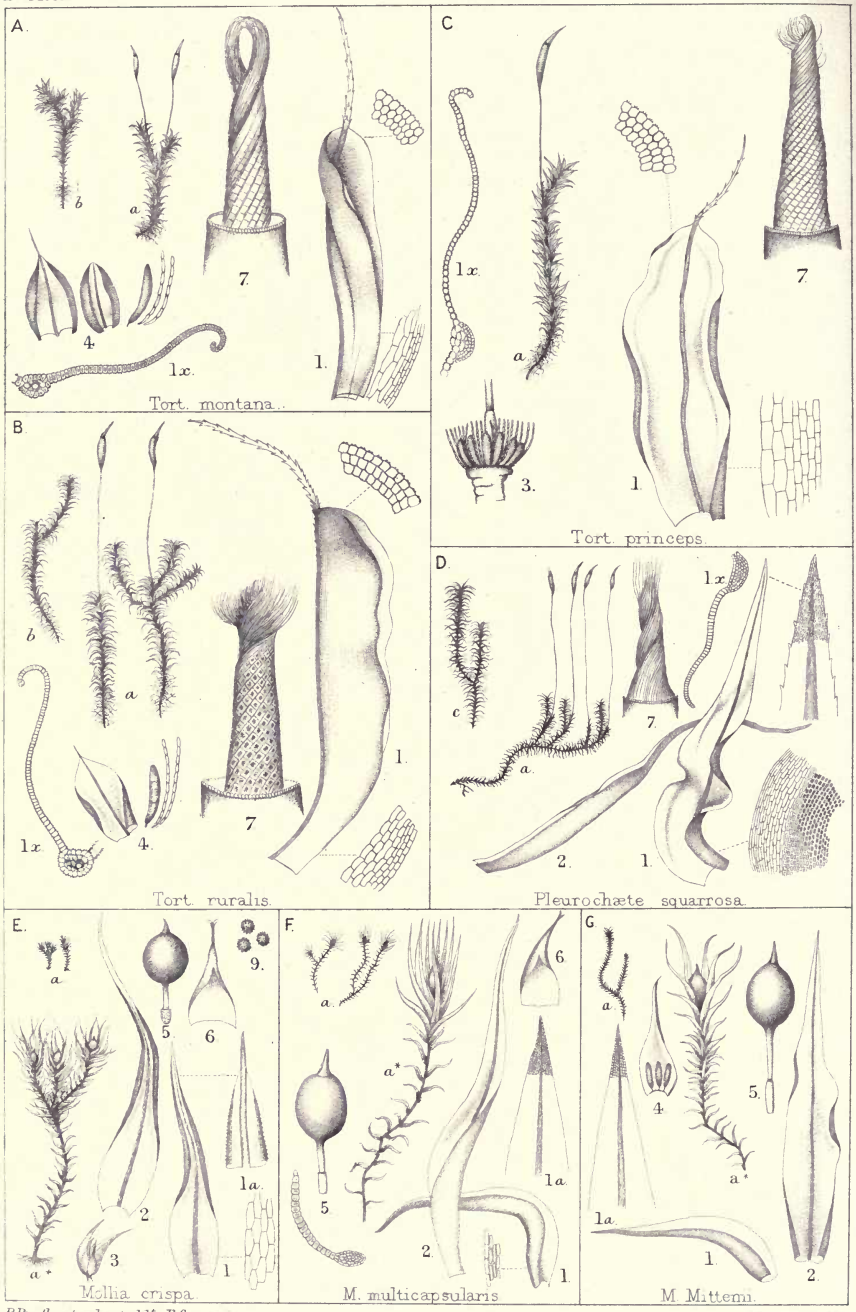

A
B
C
D
E
F
G
Phasc. curvicolle.
Pottia recta.
Pottia bryoides.
Pottia Heimii
Pottia truncatula
Pottia intermedia.
Pottia litoralis.


A.
5.
a.
3.
8.
5.
6.
4.
1x.
a*
1aa.
1.
Pottia lanceolata.
B.
5.
a.
8.
4.
6.
3.
1x.
a*
1a.
1.
Pottia cæspitosa.
D.
5.
a.
1aa.
5.
6.
a*
1x.
1.
Pottia asperula.
C.
a.
6.
5.
8.
γ.
β.
γ 5.
β 5.
1x.
1.
a*
γ*
β*
Pottia Starkei.
E.
5.
a.
9.
1aa.
5.
6.
a*
1x.
1.
Pottia viridifolia.
F.
5.
a.
5.
1aa.
1x.
a*
6.
4.
1.
Pottia Wilsoni.


A.
B.
C.
D.
E.
F.
G.
Pottia crinita.
Pottia latifolia.
Pottia pusilla.
Tortula lamellata.
Tort. brevirostris.
Tortula stellata.
Tort. ericæfolia.

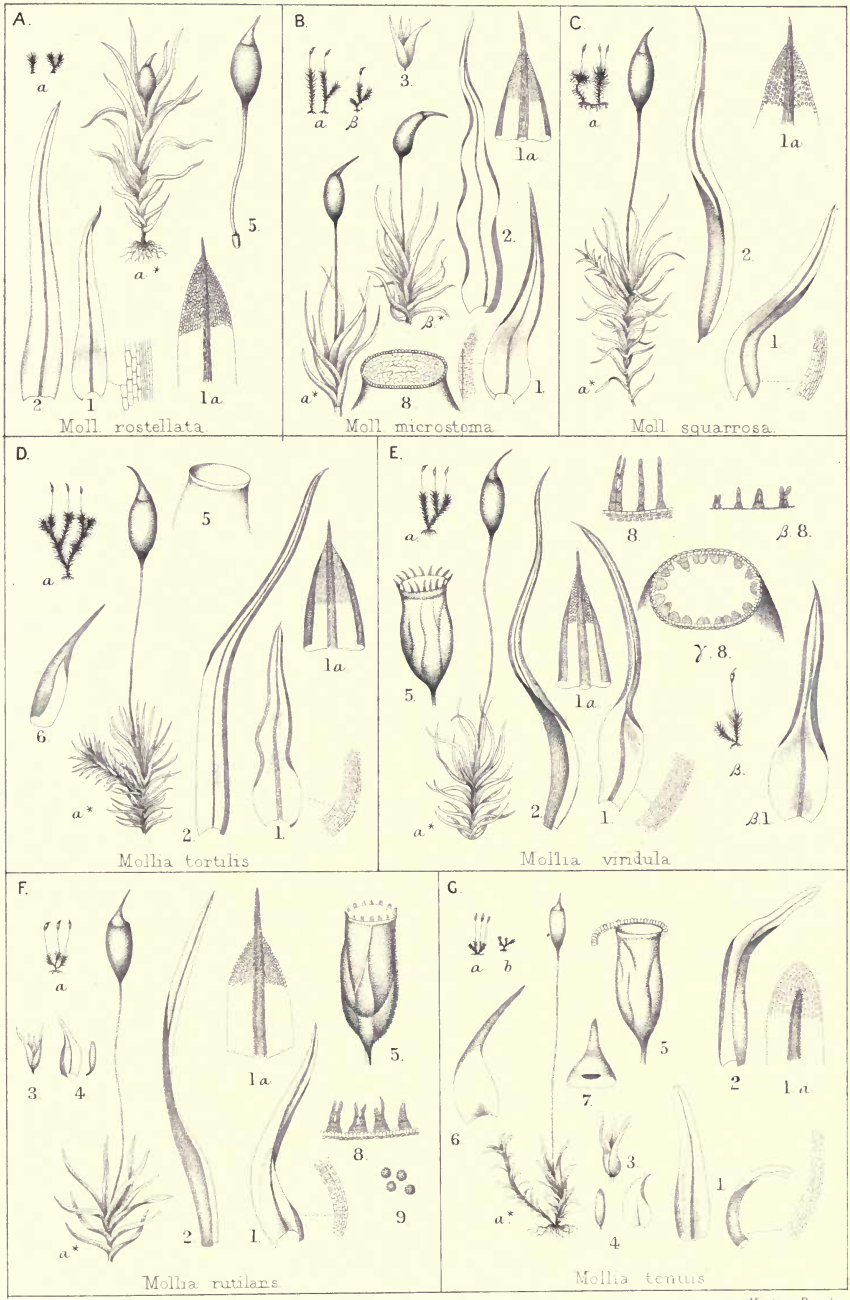

A
8
a
b
5
1
a*
1x
Tort. aloides
B
a
5.
8.
1 a a
1x
8
1
4
Tort. atrovirens.
C
5.
a
8.
1
a*
4
Tort. cuneifolia.
D
5
1x
a
8
3
a*
1 a
1
Tort. Vahlii.
E
5.
6.
a
b
1x
8
4
a*
1 a a
1
Tort. marginata.
F.
5
1x
a
3
8
1 a a
a*
1
Tort. canescens
G
5
a
8.
γ
β.
1 a a
3.
γ1.
1.
Tort. muralis.

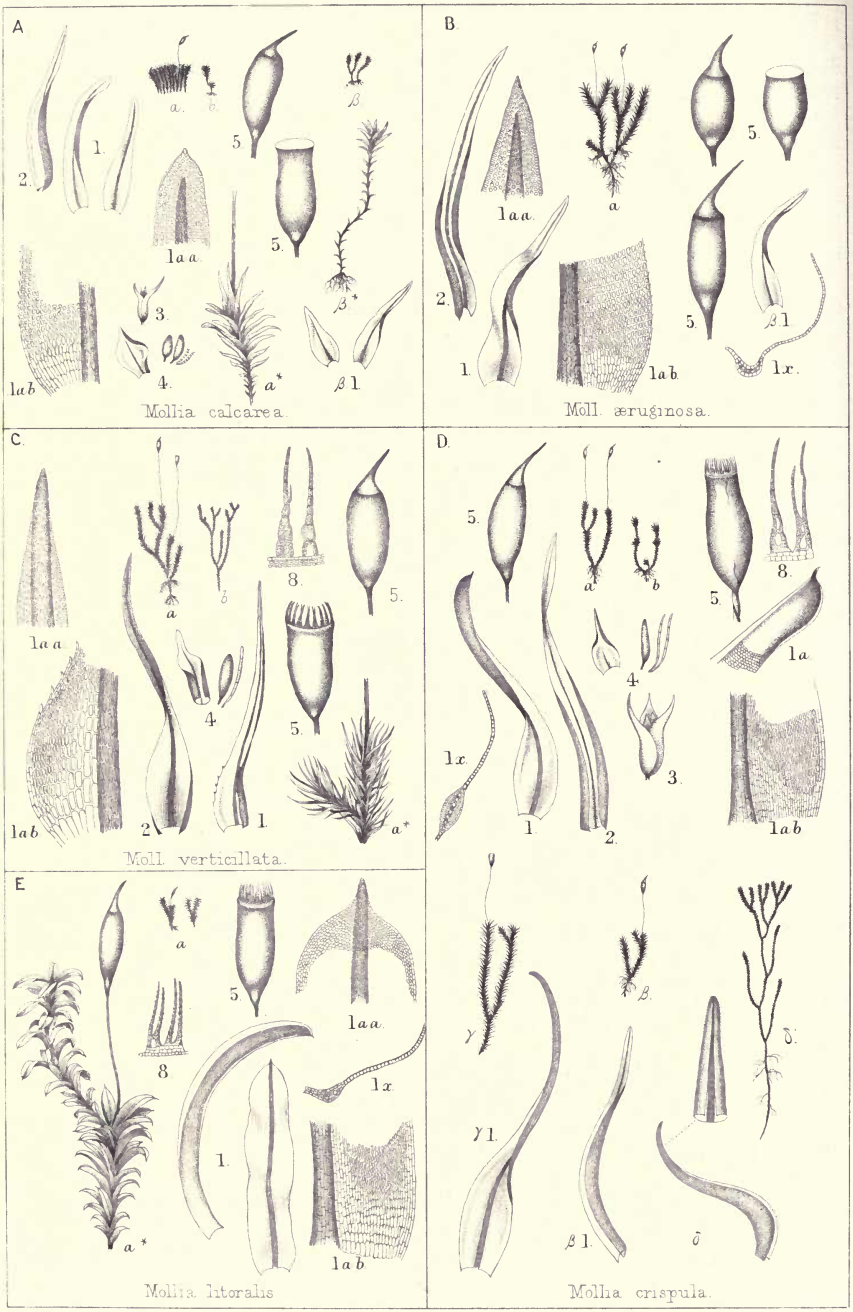

A.
Tort. mucronata
B.
Tort. subulata
C.
Tort. angustata
D.
Tort. mutica
E.
Tort. papillosa
F.
Tort. lævipila
R.Braithwaite ad nat. del. E.Carter sc
Mintern Bros. imp.

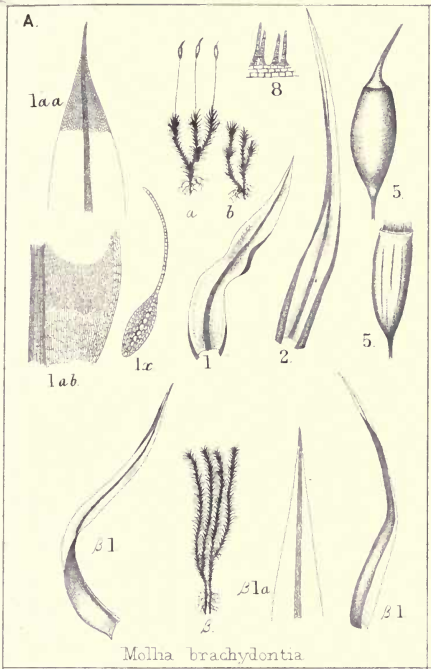


R. Braithwaite ad nat. del.t E. Carter sc.

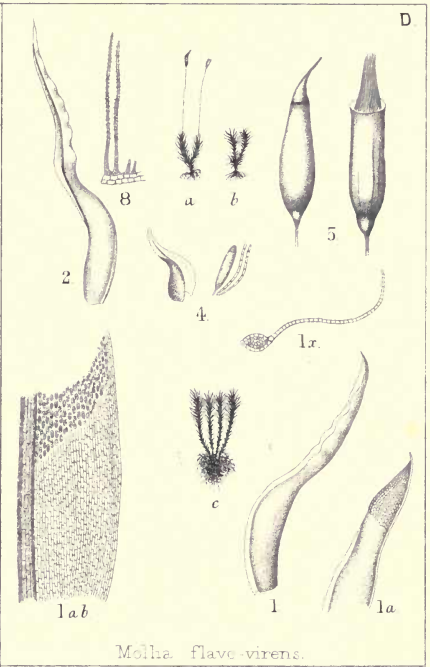
Mintern Bros imp


A.
a
a*
5.
2.
1
1a.
Moll. rostellata.
B.
a
β
3.
1a.
2.
β*
a*
8.
1.
Moll microstoma.
C.
a
1a.
2.
1.
a*
Moll squarrosa.
D.
a
5
1a.
6.
a*
2.
1.
Molha tortulis
E.
a.
8.
β. 8.
5.
γ. 8.
1a.
β.
2.
1.
a*
β1.
Mollia viridula
F.
a
3.
4.
1a.
5.
8.
9.
2.
1.
a*
Molha rutilans
G.
a.
b.
5.
7.
2.
1a.
6.
3.
1.
a*
4.
Mollia tenuis

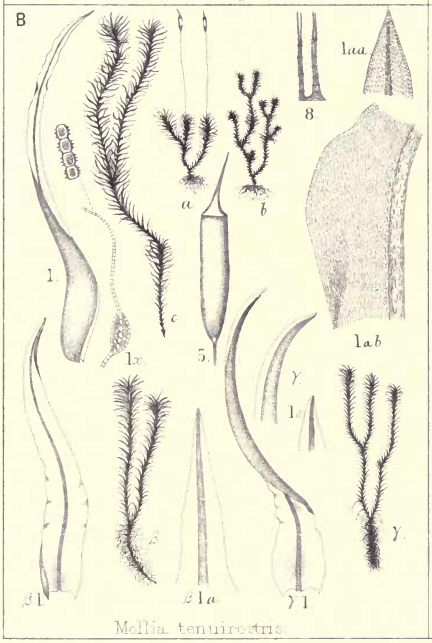

A
Mollia calcarea.
B
Moll. æruginosa.
C
Moll. verticillata.
D
E
Mollia litoralis
Mollia crispula.



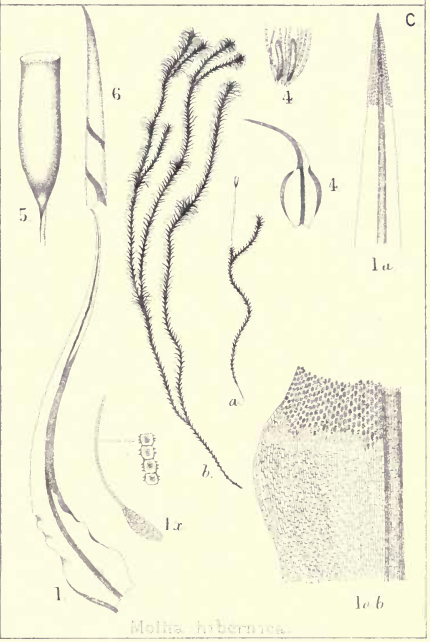
Mollia brachydontia.



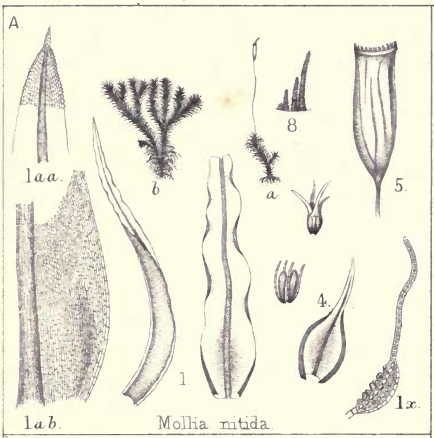
Mollia flavo-virens.



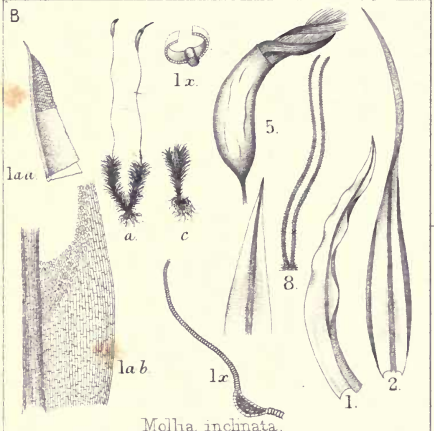
Mollia tenuirostris.



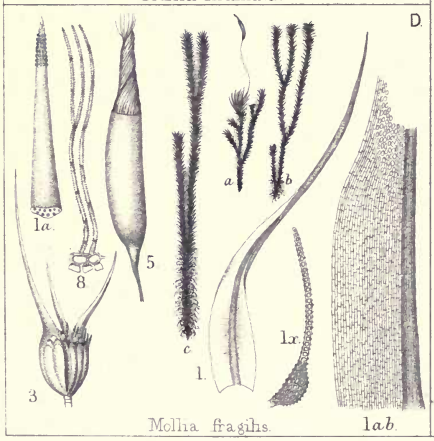
Mollia hibernica.



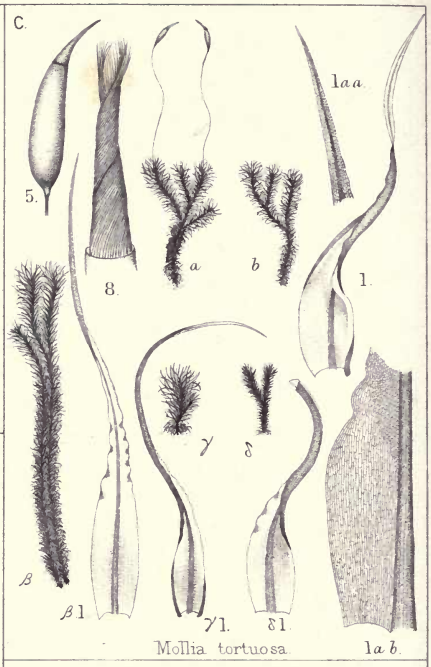
Molha nitida.



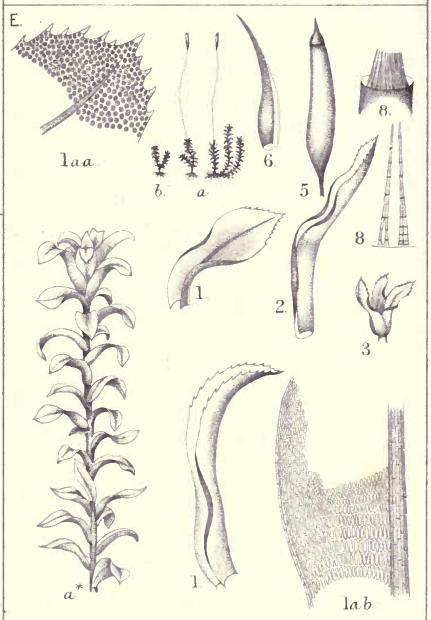
Molha inclinata.



Molha fragilis.

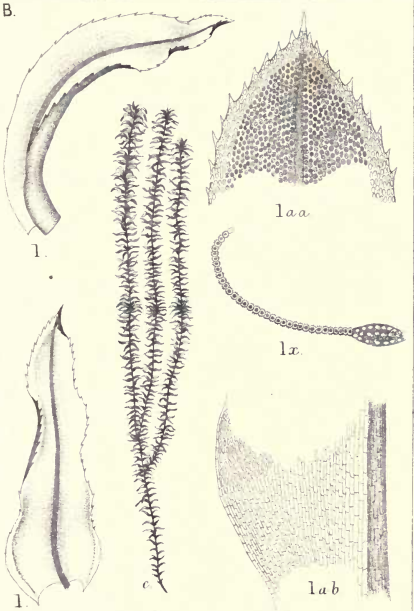


Mollia tortuosa.



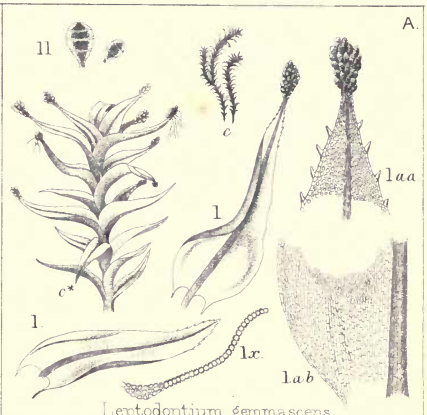
Leptodontium flexifolium.

B.



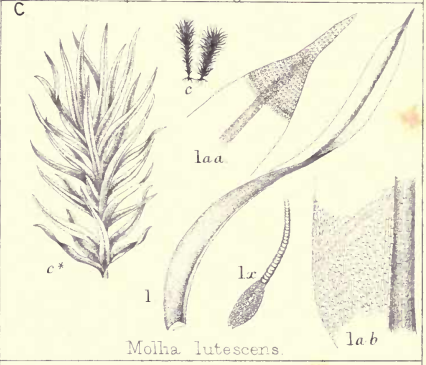
Leptodontium recurvifolium.

A.



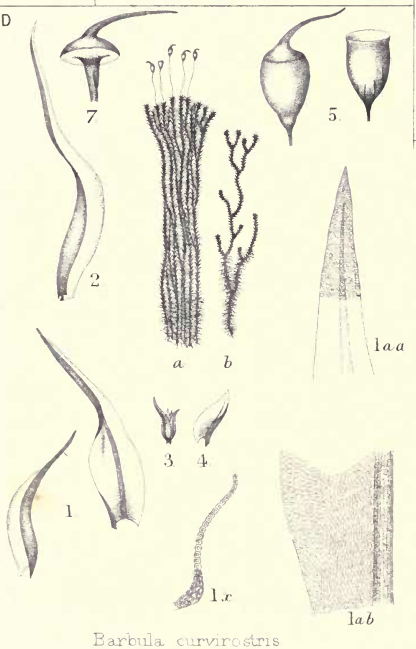
Leptodontium gemmascens.

C.



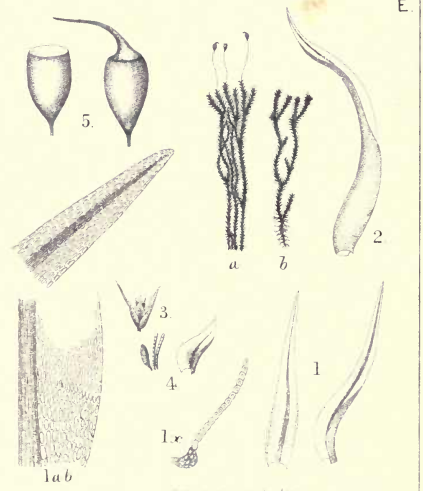
Molha lutescens.

D.

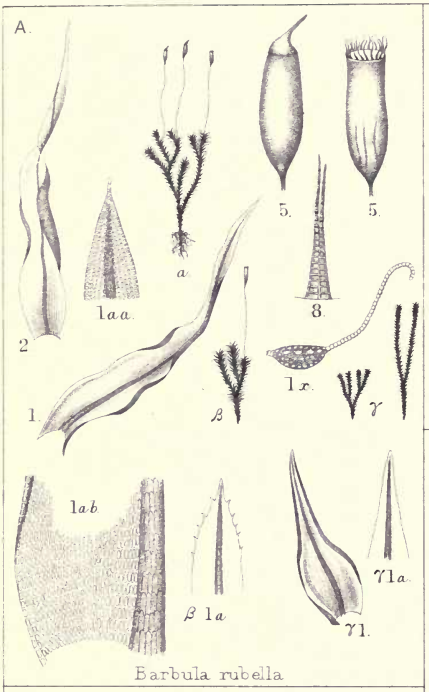


Barbula curvirostris.

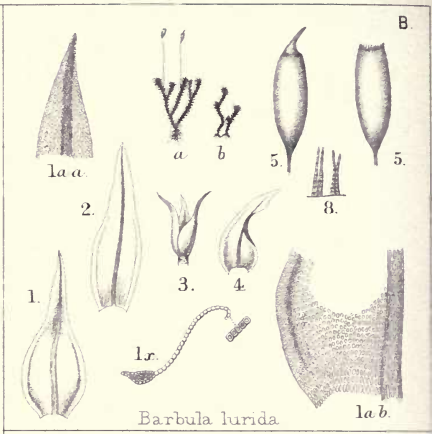
E.



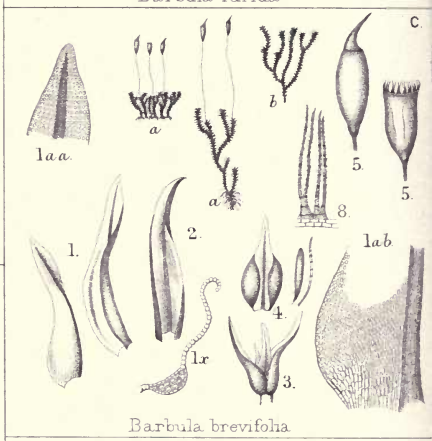
var. commutata.



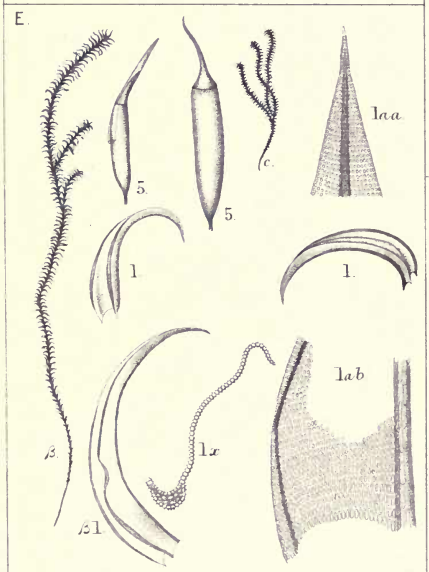
Barbula rubella.



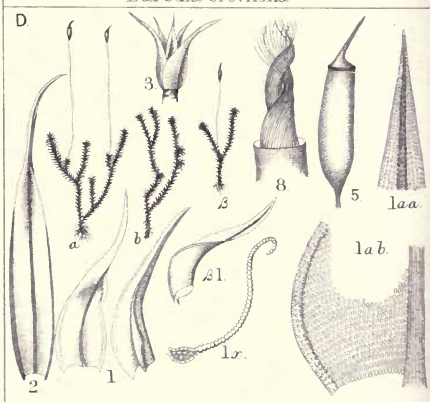
Barbula lurida.



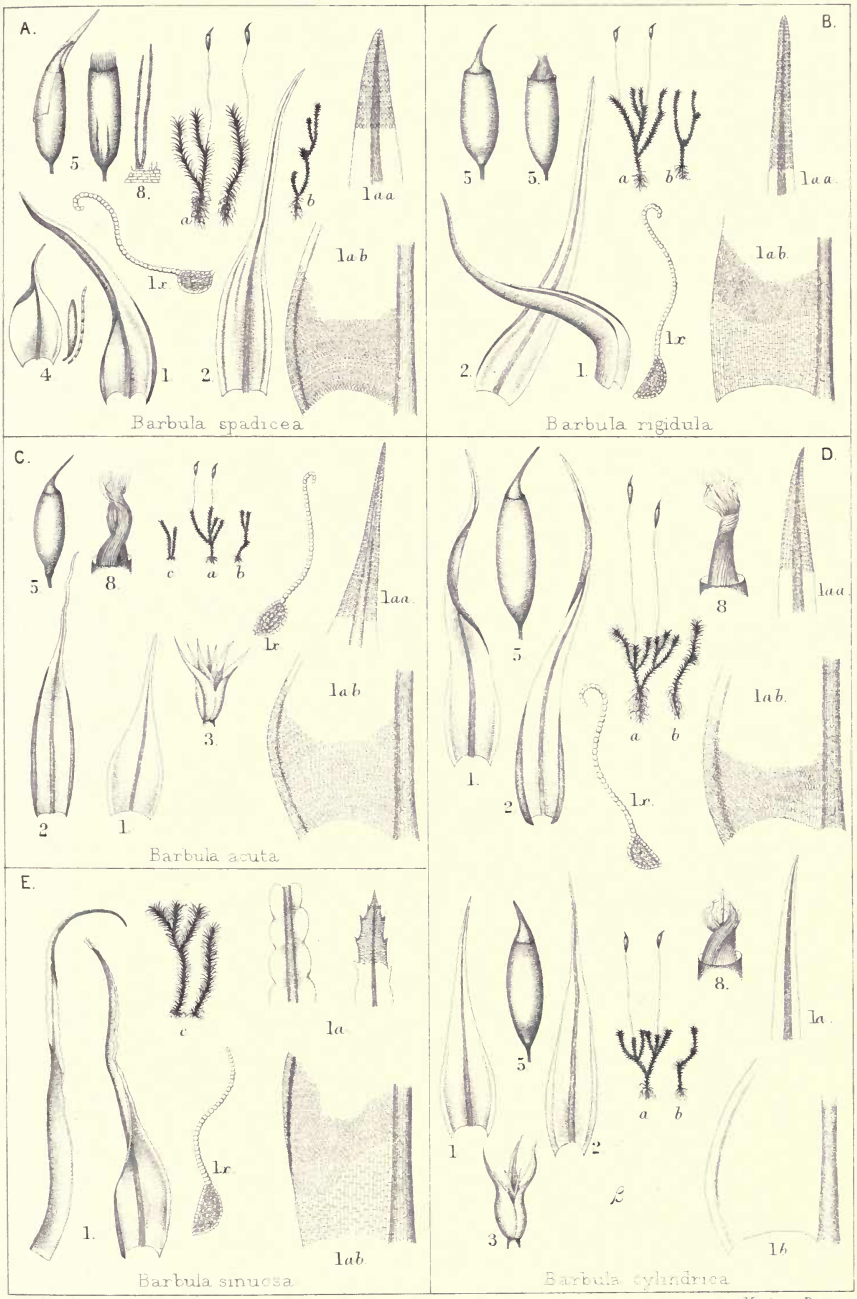
Barbula brevifolia.

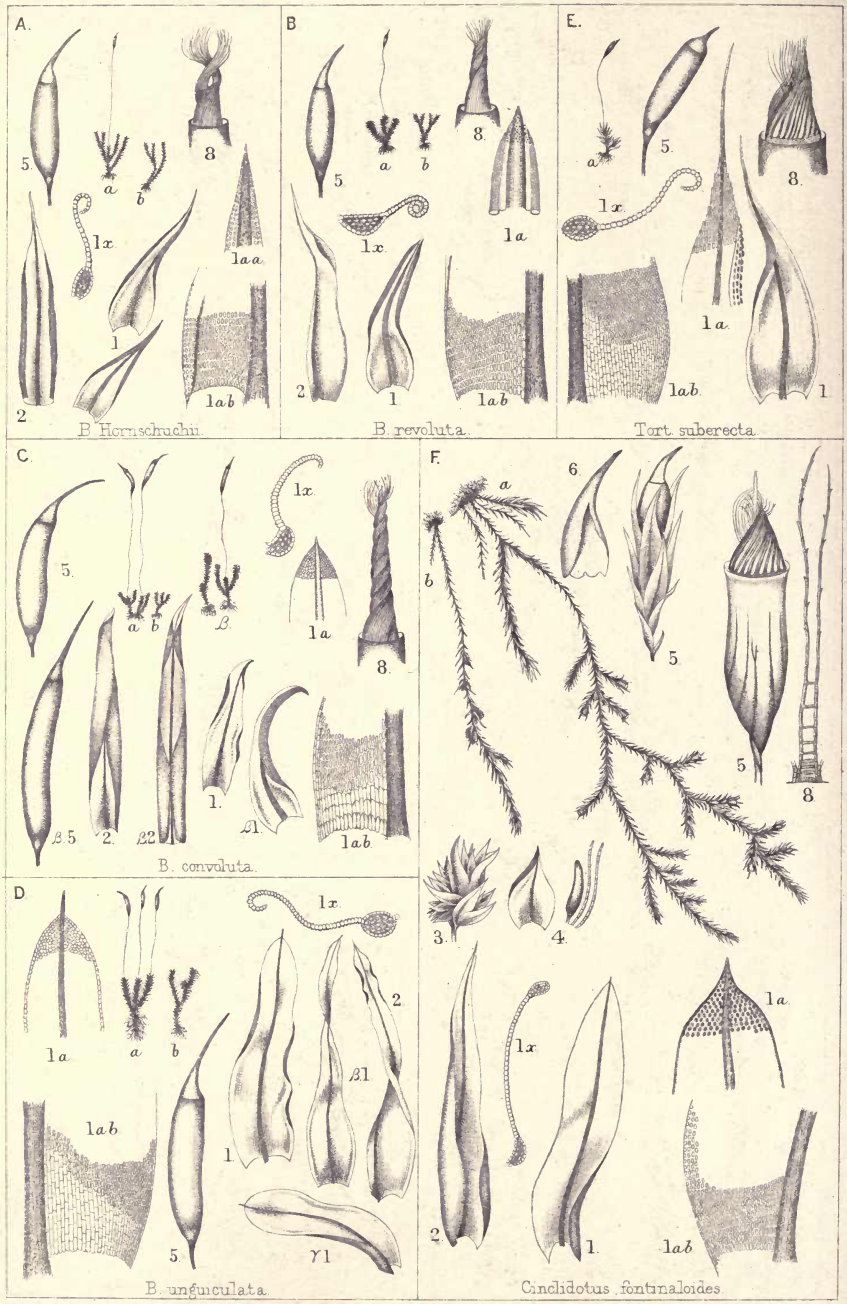


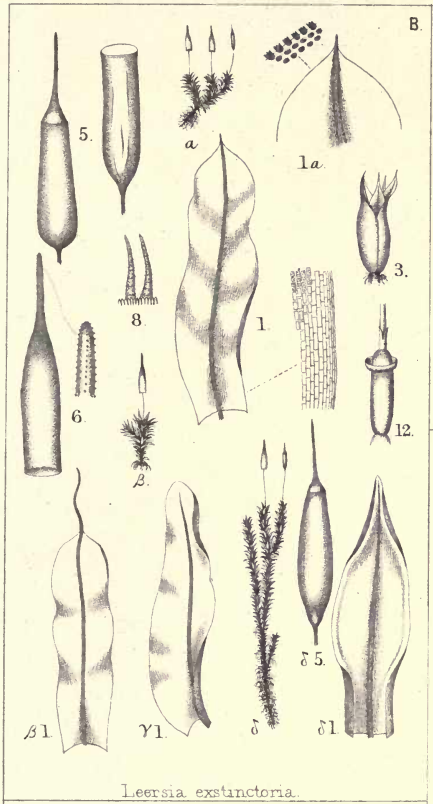
Barbula reflexa.



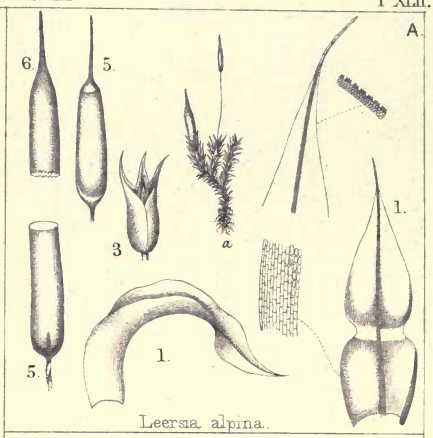
Barbula fallax.


A.
5
8.
a
b
1aa
1x
1ab
4
1
2
Barbula spadicea
B.
5
5.
a
b
1aa
1ab
1x
2.
1
Barbula rigidula
C.
5
8
c
a
b
1aa
1x
1ab
3
2
1
Barbula acuta
D.
5
8
1aa
a
b
1ab
1x
1.
2
Barbula cylindrica
E.
c
1a
1x
1.
1ab
Barbula sinuosa

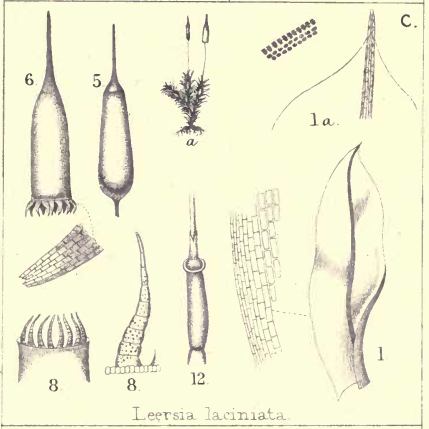

A.
B
E.
C.
F.
D
B. Hornschuchii.
B. revoluta.
Tort. suberecta.
B. convoluta.
B. unguiculata.
Cinclidotus fontinaloides
R.Braithwaite ad. nat. del. E. Carter sc.
Mintern Bros imp.



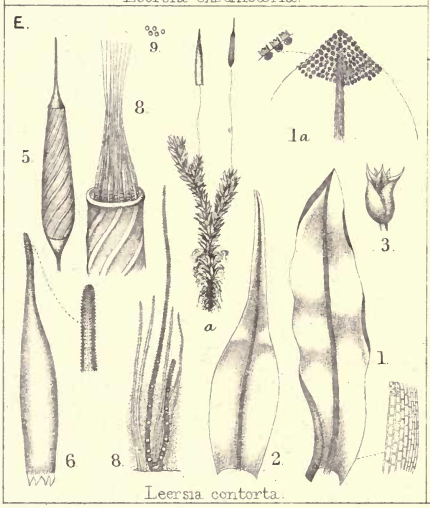
Leersia exstinctoria.



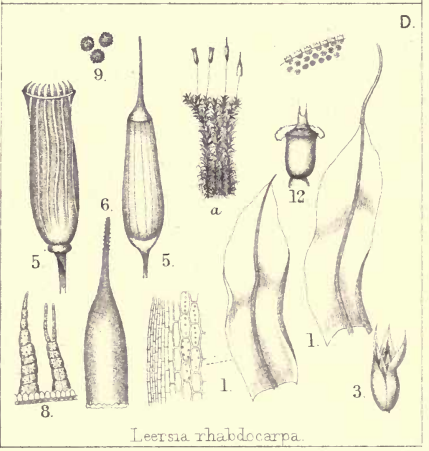
Leersia alpina.



Leersia laciniata.



Leersia contorta.



Leersia rhabdocarpa.

R. Braithwaite ad. nat. del. E. Carter sc. Mintern. Bros. imp.

WEBERACEÆ.

WEBERA. Ehrhart.

Webera sessilis (Schmid.) Lindb.

WEBERACEÆ.

Plants very short, gregarious, growing on turfy soil. Leaves lingulate or lanceolate, nerved, flexuose, crisped when dry, fragile, with rounded opaque cells in 2—3 strata. Perich. bracts larger, ciliate or serrate, aristate with the excurrent nerve, membranous; Caps. immersed or exserted, subsessile, ovoid, oblique, gibbous; calyptra conico-mitriform, entire, scarce covering the conical acuminate lid; peristome none, endostome a pale 16-plicate, conical membrane; spores minute.

This small family of 5 or 6 species has generally been united to Buxbaumiaceæ, but the only relationship to *Buxbaumia* lies in the similarity of the capsule and endostome, for in leaf structure it comes very close to Tortulaceæ, especially to the section *Tortella* of *Mollia*. The epicarpic membrane is thick at the mouth of the capsule, but all the rest is thin and flaccid, and the capsule wall stands away from the spore sac, being connected with it by short filaments.

Ehrhart's name must certainly be retained for the genus and not superseded by that of Mohr. Three years later Hedwig applied the name *Webera* to another genus, comprising *Bartramia pomiformis*, *B. Halleri* and *Meesea trichodes*—Fund. musc. II, 95 (1782)—and, apparently forgetful of this, he a third time used it as a genus of mosses for *Bryum nutans* and *pyriforme* in his Musc. frond. i, (1787); repeating this in the Sp. muscorum (1801). But in these two latter works he also founded a genus *Pohlia* for *Bryum elongatum*, a congener of *B. nutans*, and Lindberg has very cleverly settled the difficulty by maintaining the original genus *Webera* of Ehrhart, and transferring the third genus of that name to *Pohlia* of Hedwig.

WEBERA Ehrhart.

(Hann. mag. 1779, p. 257.)

The only genus and therefore the character is the same as that of the family.—Der. After G. H. Weber, author of Spicil. Fl. Goettingens.

WEBERA SESSILIS (*Schmid.*) *Lindb.*

Dioicous; dwarfish, gregarious. Leaves lingulate, entire, with the nerve vanishing; perich. bracts ovato-lanceolate, laciniato-ciliate, nerve longly aristate. (T. XLIII.)

SYN.—*Sphagnum acaulon maximum, foliis in centro ciliaribus* HALL. It. helv. 1739, p. 83, c. icone (1740), Enum. stirp. helv. i, 97 (1742). DILL. Hist. musc. 253, t. 32, f. 13 (1741), et. Herbar.

Buxbaumia sessilis SCHMID. Diss. de Buxb. 26, t. 2 (1758). HEDW. Fund. ii, 96 (1782). HOFFM. Deutsch. fl. ii, 21 (1795).

Phascum subulatum Var. *β.* HUDS. Fl. angl. 397 (1762).

Phascum subulatum OEDER Fl. dan. t. 249, p.p. (1766).

Phascum Halleri F. MUELL. Fl. fridrichs. 196 (1767). POLL. Pl. palat. iii, n. 974 (1777).

Bryum Halleri NECK. Meth. musc. 233 (1771).

Phascum maximum LIGHTF. Fl. scot. ii, 693 (1777).

Phascum montanum HUDS. Fl. angl. 2 ed. 466 (1778).

Buxbaumia foliosa WEBER Spic. fl. gott. 128 (1778). SWARTZ Meth. musc. 33, t. 4, f. 2 (1781), Musc. suec. 74, t. 4, f. 4 (1799). L. Syst. veg. 14 ed. 925 (1784). ROTH Tent. fl. germ. i, 478 (1788). WITH. Bot. arr. br. veg. 3 ed. iii, 790 (1796). HULL Br. fl. P. 2, 276 (1799). BRID. Musc. rec. II, P. III, 150 (1803). SM. Eng. Bot. t. 329. Fl. brit. iii, 1148 (1804). TURN. Musc. hib. 104 (1804). SCHULTZ Fl. starg, n. 355 (1806). ROEHL. Deutsch. fl. iii, 120 (1813). WAHLENB. Fl. carp. 363 (1814). SCHWAEG. Suppl. I, P. II, 65 (1816). HUEBEN. Musc. germ. 540 (1833).

Webera Diphyscium EHRH. Hann. mag. 1779, p. 257. Beitr. i, 189 (1787).

Bryum phascoides JACQ. Collect. ii, 220 (1788.)

Diphyscium foliosum MOHR Obs. bot. 34 (1803). WEB. MOHR Bot. Tasch. 377, t. 11, f. 1 (1807). VOIT Musc. herb. 112 (1812). BRID. Sp. musc. III, 112 (1817), Mant. 123 (1819), Bry. univ. i, 326 (1826). MART. Fl. cr. erl. 85 (1817). HOOK. TAYL. Musc. br. 16, t. 8 (1818). FUNCK Moost. 37, t. 24 (1821). GRAY Nat. arr. br. pl. i, 717 (1821). HOOK. Fl. scot. P. II, 124 (1821), Br. fl. ii, 13 (1833), Fl. Lond. HARTM. Skand. fl. MACK. Fl. hib. P. 2, 12 (1836). BR. SCHIMP. Bry. eur. fasc. 1, t. 2, et fasc. 64, Suppl. (1837). DE NOT. Syll. 145 (1838), Epil. bri. ital. 349 (1869). RABENH. Deutsch. kr. fl. ii, S. 3, 240 (1848). C. MUELL. Synops. i, 812 (1849). WILS. Bry. brit. 201, t. 8 (1855). JENS. Bry. dan. t. 8, f. 40 (1856). SCHIMP. Synops. 451 (1860), 2 ed. 547. BERK. Handb. br. m. 214, t. 19, f. 5 (1863). MILDE Bry. siles. 254 (1869). HOBK. Syn. br. m. 99 (1873). HUSN. Mouss. nord-ouest 138 (1873). JURATZ. Laubm. oesterr.-ung. 351 (1882). LESQ. JAMES Mosses N. Amer. 267 (1844).

Hymenopogon heterophyllum P. BEAUV. Prodr. 60 (1805).

Diphyscium sessile LINDB. in Oefv. Vet. Ak. foerh. xx, 303 (1863).

Webera sessilis LINDB. in Op. c. 394, in obs. (1863) et xxi, 576, in nota (1864); in Not. saells. pro Fauna et fl. fenn. foerh. ix, 157 (1867).

Dioicous; brown or blackish green, in expanded tufts. Stems very short, radiculose; leaves lingulate, curled when dry, chlorophyllose, thick, of three strata of minute rounded hexagonal cells above, narrowly rectangular at base; apex concave, obtuse, the margin crenulate with projecting cells, nerve vanishing below apex. Perich. bracts very large, rufescent at base, ovato-lanc., thin and membranous without chlorophyl, deeply serrate or lacerate and ciliate at apex, the nerve excurrent in a long roughish piliform arista, cells quadrate and rectangular, hyaline, with incrassate transverse walls. Caps. immersed in the perichætium, pale yellowish-brown, leptodermous, ventricosely ovato-conic, oblique; mouth small with an annulus of a single series of cells; lid conic, acuminate, peristome none or represented by irregular projecting fragments of tissue; endostome a white membrane twisted in a cone, 16-carinato-plicate, the ridges thickened and papillose; spores minute, smooth, green.

Male plants short, scattered, the infl. gemmiform, terminal, inner bracts ovate, concave, nerve excurrent.

HAB.—Turfy banks and moist rocks in mountain districts; not uncommon. Fr. 8.

Var. *β.* **acutifolia** *Lindb.*

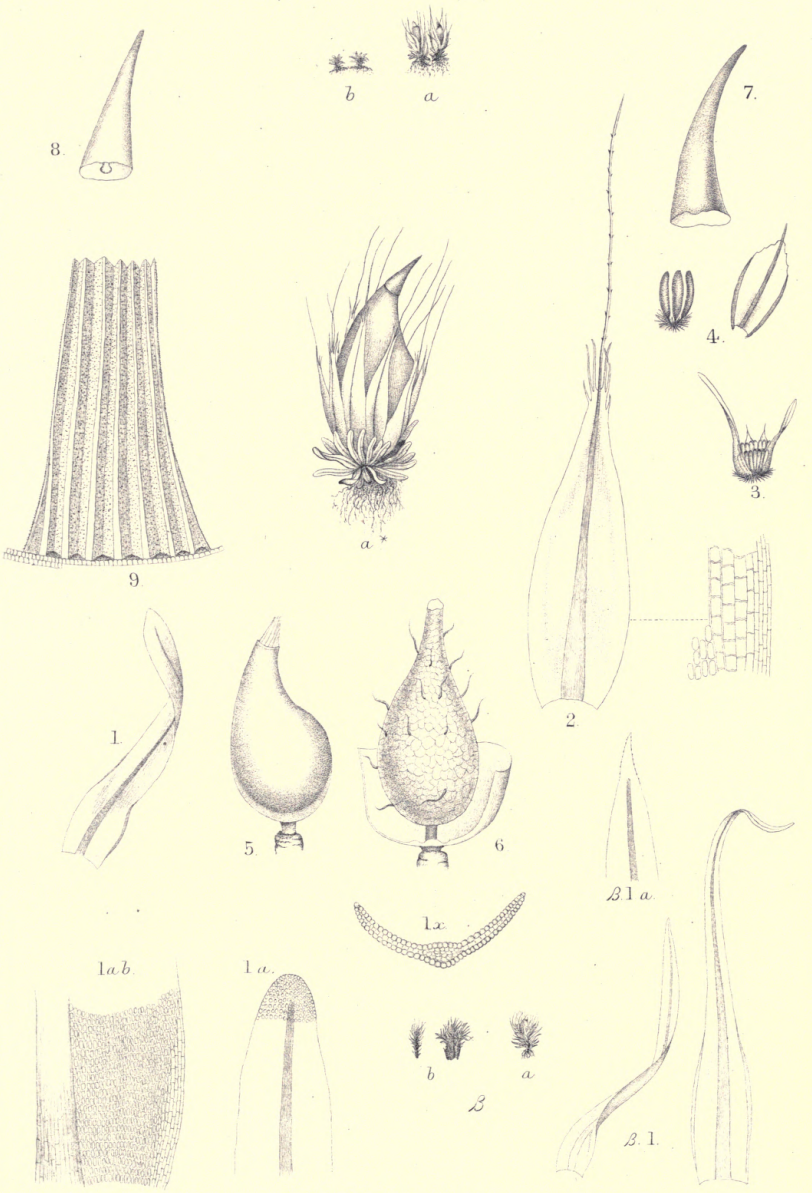
Plants taller, denser and more branched; leaves longer, acuminate, acute, arista of perich. bracts smooth.

HAB.—With the type, but more frequently in Ireland, though usually sterile. Connemara c. fr. (*Moore* 1853)!! Luggielaw (*Lindberg* 1873)!!

TAB. XLIII.

Webera sessilis (Ben Lawers, *Braithwaite*). *β.* Var. *acutifolia* (Ireland, *Lindberg*).

a. Fertile, b. male plant. a*. Fertile pl. mag. 1. Leaf, 1 a. apex. 1 ab. areolation of base, 1 x. transv. section. 2. Perich. bract. 3. Male infl. 4. bract and antheridia. 5. Capsule. 6. Spore sac. 7. Calyptra. 8. Operculum. 9. Endostome.



Webera sessilis

SUPPLEMENT.

ANDREÆACEÆ.

ANDREÆA CRASSINERVIS *Bruch.*

Var. β **Huntii** (*Limpr.*)

Plants taller. Leaves longer with a narrower nerve; perich. bracts shorter, obovate, obtuse or apiculate.

Syn.—*A. commutata* (non C. Muell.) Limpr. in 61 Jahresb. der Schles. Ges. 221 (1883).
A. Huntii Limpr. in Rabenh. kr. fl. 2 ed. band. iv, 145, f. 55 (1886).

Hab.—Loch Kandor (*Hunt* 1871)!! Buttermere and Borrowdale (*Hunt* 1871)! Styehead Pass and Scawfell (*Baker* 1879)!!

Although from the longer slender stems with laxer leaves, this has a distinct appearance, we do not think it has characters sufficient to separate it from *A. crassinervis;* the lamina of the leaf narrows upward and vanishes more gradually than in that species, of which we prefer to regard it as a variety, but the specimens were referred by Schimper to *A. falcata.* A third closely allied plant from Steïermark, is named by Lindberg *A. angustata.*

POLYTRICHACEÆ.

Catharinea Dixoni Braithw. MSS. Dixon in Journ. Bot., 1885, p. 169.

This species must be erased from the list, as it proves to be only a form of *Polytrichum gracile* with fewer lamellæ than usual.

LEUCOBRYACEÆ.

2. LEUCOBRYUM MINUS *Hampe.*

Dioicous; resembling *L. glaucum*, but much smaller. Leaves very dense, narrower, erect. Caps. oblong, sub-erect, nearly regular, not strumose. (T. XLV, B.)

Syn.—*Bryum albidum et glaucum fragile minus, foliis erectis, setis oblongis* Dill. Hist. musc. 546, t. 83, f. 8 (1741) et Herbar.
Dicranum albidum Brid. Musc. rec. II, P. I, 167 (1798), Sp. musc. I, 205 (1806), Mant. musc. 67 (1819).
Dicranum glaucum β. *albidum* Web. Mohr. Brid. Bry. univ. i, 409 (1826).

Leucobryum minus HAMPE MSS. SULLIV. Mosses Un. St. 24 (1856). LESQ. JAMES Mosses N. Amer. 91 (1884).

Leucobryum vulgare β. *minus* HAMPE *in Linnæa* xiii, 42 (1839). C. MUELL. Synops. i, 75 (1849).

Leucobryum glaucum β. *minus* C. MUELL. *Linnæa* 1844, p. 687.

Leucobryum albidum LINDB. in Oefv. Vet. ak. foerh. 1863.

Dioicous; in dense whitish tufts, ¾ in. high. Leaves very dense, thin, narrow, more acuminate, erect. Caps. obliquely inclined, nearly regular, not strumose.

HAB.—On sandy hillocks under beech trees in the New Forest, at Boldre Bridge and Holmsley Station, Lyndhurst. (*Piffard*, April, 1882)!!

This moss was distinguished as a species by Dillenius, and seems entitled to rank as such by its more delicate texture, and different capsule. Hitherto it has been regarded as exclusively American, and I have seen no other record of its occurrence in Europe.

DICRANACEÆ.

Subf. 2. *TREMATODONTEÆ*. Plants small, cæspitose; leaves lanc.-subulate, without enlarged basal angular cells. Caps. with a long swollen neck, longer than the capsule; per. of 16 lanceolate teeth, perforated in the middle or cleft; sometimes cleistocarpous.

TREMATODON Michx.

RICH. Fl. bor.-Amer. ii, 289 (1803).

Plants short, cæspitant. Leaves lanc.-subulate, nerved, the cells hexagono-rectangular, perich. bracts distinct. Calyptra inflato-cucullate, rostrate; caps. on a tall seta, elliptic or oblong, subcernuous, defluent into a long swollen neck, once or twice as long as caps., which is oblong and gently curved, per. of 16 lanceolate teeth, subentire, perforated or cleft into two unequal legs.—Der. τρημα a foramen, οδους a tooth.

1. **TREMATODON AMBIGUUS** (*Hedw.*) *Hornsch.*

Autoicous; in small dense tufts. Leaves from an ovate-oblong base, suddenly lanc.-subulate, nerve excurrent. Caps. subclavate, subcernuous, the neck of equal length, teeth perforated vertically or cleft into two unequal legs. (T. XLV, C.)

SYN.—*Dicranum ambiguum* HEDW. Musc. frond. iii, 87, t. 36 (1792), Sp. musc. 150 (1801). BRID. Musc. rec. II, P. I, 180 (1798), Sp. musc. I, 222 (1806). SWARTZ Musc. suec. 36 (1799). ROTH Fl. germ. iii, P. I, 169 (1800). P. BEAUV. Prodr. 53 (1805). WEB. MOHR Bot. Tasch. 195 (1807). STURM Deutsch. fl. II, 8. SCHWAEG. Suppl. I, P. I, 194 1811). ROEHL. Deutsch. fl. iii, 75 (1813). MART. Fl. cr. erl. 106 (1817).

Trematodon ambiguus HORNSCH. Flora 1819, p. 88; Bry. germ. ii, P. II, 206, t. 43, f. 2 (1831). BRID. Mant. 52 (1819). FUNCK Moostach. 20, t. 19 (1821). SCHWAEG. Suppl. II, P. I, 69 (1823). HUEBEN. Musc. germ. 149 (1833). DE NOT. Syllab. 223 (1838), Epil. bri. ital. 663 (1869). HARTM. Skand. fl. BR. SCHIMP. Bry. eur. fasc. 29—30, p. 5, t. 2 (1846). RABENH. Deutch. kr. fl. ii, S. 3, 135 (1848). C. MUELL. Synops. i, 457 (1849). SCHIMP. Synops. 67 (1860), 2 ed. 68. MILDE Bry. siles. 56 (1869). JURATZ. Laubm. oesterr.-ung. 29 (1882). HOBK. Syn. br. m. 2 ed. 65 (1884). LESQ. JAMES Mosses N. Amer. 63 (1884).

Trematodon vulgaris BRID. Bry. univ. i, 386 (1826).

Autoicous; in small dense tufts, pale green or fuscescent; stems short, branched, radiculose at base. Leaves erecto-patent, flexuose, from a concave ovate-oblong base, suddenly lanceolate-subulate, canaliculate, entire; nerve semiterete, excurrent in the subula, cells at base narrow rectangular, above rhombic or hexagonal; perich. bracts much larger, elongate-oblong, gradually acuminate, laxly areolate at base. Caps. on a long flexuose straw-coloured seta, oblong, straw-coloured or orange-brown, the neck cylindric, long as capsule, subarcuate, tumidly strumose, the base abrupt at the inner side; annulus broad, lid conic, subulate rostrate; teeth confluent at base on an exserted membrane, cleft into two unequal legs, or perforated in the middle line, red, incurved when dry. Male infl. terminal on a basal branch, bracts small, ovate convolute, acuminate, nearly nerveless.

HAB.—Bare wet turfy places in subalpine districts; very rare. Fr. 7—8.

In a path at base of Schiehallion, near Tummel bridge, Perthshire (*Braithwaite* and *Crombie*, 1883)!!

The species of this beautiful genus are remarkable for the long neck to the capsule which gives the fruit a peculiar club-shaped appearance. Only a single tuft was found, and that was growing in the centre of a patch of the rosy red form of *Bryum pallens*. The genus *Bruchia* also belongs to this subfamily.

BLINDIA.

3. **BLINDIA TRICHODES** (*Wils.*) *Lindb.*

Dioicous; in small, bright green tufts. Leaves more or less secund, from an oval concave base, longly subulate. Caps. hemispherical, with short truncate teeth. (T. XLV, D.).

SYN.—*Dicranum trichodes* WILS. MSS.
Blindia acuta Var. *trichodes* BRAITHW. in Journ. Bot. 1870, p. 228.
Blindia trichodes LINDB. PHILIB. in Rev. bryol. 1884, p. 90.

Dioicous; small, in bright green or yellowish green tufts, fuscescent at base. Leaves more or less secund, lower short, upper much longer, from a shortly oval concave base, longly subulate, the subula formed entirely of the nerve, canaliculate, denticulate at apex, three times the

length of limb. Seta short and pale, caps. hemispherical, greenish straw-colour, when old turbinate, lid pale, long subulate, per. bright red, the teeth short truncate, of only 3—4 rectangular articulations, smooth, sometimes foraminate. Male plants in separate tufts, much smaller than female, bracts ovato-lanceolate.

HAB.—Wet shaly rocks; sterile.

Entwistle, near Bolton (*Scholefield*, 1863)!! Egerton, Cheshire (*Whitehead*, 1865)! Astley chapel, near Bury (*Dr. Wood*, 1864)! Green's clough, Todmorden (*Nowell*, 1867)!! Marsden, near Burnley (*Whitehead*, 1865)!! Bamford Wood (*Holt*, 1878)!! Ramsden clough and Gorple clough, Todmorden (*Holt*, 1880)!!

Very close to *B. acuta* and resembling it in areolation, but in the latter the lamina narrows more gradually and runs up to the middle of leaf; the nerve is rounder and more rigid, and the tufts are generally black at base. It has also been found in Madeira and the Caucasus, and with fruit in the Riesengebirge, and in Corsica by Philibert, but these are only $\frac{1}{3}$ the height of British specimens.

CAMPYLOPUS.

CAMPYLOPUS ATROVIRENS.

Var. γ. **epilosus** *Braithw.*

Plants more slender, with softer narrower more patent leaves, the attenuated subula without any hyaline point.

HAB.—Dingdong moor, Penzance (*Marquand* 1883)!! Isle of Man (*Holt* 1881). Tyn-y-groes (*Holt* 1882).

Another moss of this genus from Jersey, is referred by Mr. Boswell with a ? to *Campylopus adustus* DE NOT. of which we have no specimens for comparison. We have little doubt however that the Jersey plant is a form of *C. introflexus*, with the hair-points very short or altogether wanting.

CAMPYLOPUS SUBULATUS.

Var. β. **elongatus** *Bosw.*

In wide dense pale yellowish-green tufts. Stems tall, slender 1—2 in. long, radiculose at base. Leaves more distant, of thinner texture, with a more elongated subula.

SYN.—*Campylopus brevifolius* Var. *elongatus* Bosw. in Naturalist 1883, p. 28.

HAB.—Banks of the Wye near Builth (*Boswell* 1883).

The aspect of this moss is very different from the ordinary state, and this may be greatly due to the locality in which it was found, for the stems show 3 years growth and are full of fine sandy deposit from the river; it is probable, therefore, the elongation of the stem is due to an effort of the plant to escape suffocation.

CAMPYLOPUS PARADOXUS.

This has turned up in several localities, and in such varied forms that it is clear it must be reduced to a variety of *C. flexuosus*.

8.* DICRANUM UNDULATUM *Ehrh.*

Dioicous; robust, densely tomentose. Leaves from a broad base, lineal-lanceolate, strongly undulate, coarsely serrate at margin and in two rows at back of nerve. Caps. aggregate, oblongo-cylindric, arcuate; lid with a long subulate beak.

SYN.—*Dicranum undulatum* EHRH. Pl. crypt. exsicc. n. 271 (1792). STURM. Deutsch. Fl. II. 10. VOIT Musc. herb. 87 (1812). MART. Fl. cr. erl. 97 (1817). HUEBEN. Musc. germ. 239 (1833). DE NOT. Syllab. 211 (1838), Epil. bri. ital. 615 (1869). BR. SCH, Bry. eur. fasc. 37-40, p. t. 34-35 (1847). RABENH. Deutsch. kr. fl. ii, S. 3, 148 (1848). C. MUELL. Synops. i, 355 (1849). SCHIMP. Synops. 94 (1860), 2 ed. 97. MILDE Bry. siles. 74 (1869). HUSN. Mouss. nord-ouest, 55 (1873). JURATZ. Laubm. oesterr.-ung. 50 (1882). LESQ. JAMES Mosses N. Amer. 76 (1884). LIMPR. in RABENH. kr. fl. 2 ed. 346 (1887).

Bryum rugosum HOFFM. Deutsch fl. ii, 39 (1795).

Dicranum rugosum BRID. Sp. musc. I, 175 (1806), Mant. 57 (1819), Bry. univ. i, 414 (1826). ROEHL. Deutsch. fl. iii, 67 (1813).

Dicranum polysetum SWARTZ Musc. suec. 34 and 87, t. 3, f. 5 (1799). SCHWAEG. Suppl. I, P. I, 165, t. 41 (1811).

Dioicous; loosely tufted, ascending, glossy, bright green above, pale fuscous below. Stems 2—10 in. high, coated nearly to apex with dense pale rufous tomentum; branches few, dichotomous. Stem leaves squarroso-patulous, the terminal erect, falcato-secund, from a broad oblong base, narrowly lineal-lanc., more or less plicate, strongly undulate transversely, complicato-concave, the margin revolute below, coarsely and sharply serrate above, nerve narrow, flattened, vanishing in the attenuated apex, bilamellate at back, the upper $\frac{2}{3}$ with two divergent rows of coarse teeth; the basal angular cells large, orange, quadrato-hexagonal, upper linear, narrow, elongated. Perich. bracts very broad, convolute in a lax cylinder, prolonged into a ligulate flexuose subula, coarsely serrate above, the nerve obsolete. Caps. on a pale red seta, 2—6 aggregated in one perichætium, oblongo-cylindric, arcuate, lid long as caps. conic with a long pale subulate beak; annulus simple, teeth large, deep red. Male gemmaceous, nestling in the tomentum.

HAB.—Shady sandy woods and turfy heaths. F. 7—8.

Moorland near Wolford, Stour valley, Warwick, sterile (*Bagnall*, May 30th, 1887)!!

It is with great pleasure that at the last moment I am able to insert this interesting discovery by my valued friend, Mr. Bagnall, for it seemed strange indeed that a plant common through all Europe and N. America should be

wanting here, yet its rarity with us is certain, or so conspicuous a plant would before this have rewarded our numerous collectors. The strongly undulated leaves, and serrate, bilamellate nerve at once distinguish it. I hope to give the figure of it in the Supplement to the next volume.

DICHODONTIUM PELLUCIDUM.

Var. γ. **strictum** *Braithw.*

Stems elongated, densely tufted, straight, slender, fastigiate. 1½ in. high. Leaves distant, very short, at the middle suddenly narrowing with incurved margins, and tapering upward into an obtuse scarcely denticulate point. (T. XLV, F.)

HAB.—Among short grass, Blorenge mountain, near Abergavenny (*Mitten* 1883)!!

The short leaves and close straight stems give this moss an aspect widely different from that of the type, with which however it quite agrees in cell structure.

ONCOPHORUS (SECT. RHABDOWEISSIA).

9. **ONCOPHORUS CRENULATUS** (*Mitt.*) *Braithw.*

Autoicous; in taller lax soft tufts. Leaves patent, ligulate, obtuse, crenulato-serrate in upper half, nerve vanishing at apex, upper cells lax, subquadrate, Caps. oval. (T. XLV, E.)

SYN.—*Rhabdoweissia denticulata* WILS. in Kew Journ. Bot. ix, 293 (1857).
Didymodon crenulatus MITT. Journ. Linn. Soc. i, Suppl. 23 (1859).

Autoicous; loosely cæspitose, more robust than *Onc. crispatus*, ½—1 in. high, dull green, dichotomous. Leaves lax patent, flaccid, ligulate, obtuse or pointed, flattish, recurved at apex, crenulato-serrate from middle to apex, nerve vanishing below the point, basal cells hyaline, elongated, upper rounded-quadrate, sub-obscure with the primordial utricle. Perich. bracts similar. Caps. on a short yellow seta, rufous, oval, sulcate when old, lid rostrate, teeth red, narrow, erect when dry.

HAB.—Wet rocks. Fr. 6—7.

Lochgoil head and Ben Voirlich (*Hunt* 1865)!! Beddgelert (*Hunt* 1865)!! Abergynalwyn (*Rogers* 1879)!! Pont Aberglaslyn (*Mitten*). Cwm Bychan and Tyn-y-Groes (*Holt* 1883)!!

This was confused with *O. crispatus* both in description and figure, the leaves are much broader than in that species, and the upper cells half as large again. The figures O. c. are drawn from *O. crispatus*.

TORTULACEÆ.

3. ACAULON MEDITERRANEUM *Limpr.*

Autoicous; resembling *A. muticum*, but more slender, inner perich. bract very large, convolute, entire. Caps. minutely apiculate, spores nearly smooth. (T. XII,* I.)

SYN.—*Acaulon mediterraneum* LIMPR. in RABENH. krypt.-fl. von Deutschl. 4 Band, 180 (1886).

Autoicous; pale yellowish green, in cæspitose patches; plants more slender and conical. Leaves short broad, entire, nerved to apex, upper cells smaller, rhombic. Perich. bracts two, unequal, innermost very large, oblong, convolute and enfolding the fruit, with a short flat acute point, quite entire or with 2—3 short irregular teeth, nerved to apex; outer ⅓ as long, obovate, acute, the margins involute. Caps. erect, reaching to middle of inner bract, globose, leptodermous, castaneous, minutely apiculate; spores nearly smooth.

HAB.—Top of a hedge-bank at Douglas, I. of Man. (*Holt* Oct. 1886)!!

Although very close to *A. minus*, this little moss has a different aspect, from the longer inner bract, completely wrapped round the fruit, and narrowing upward, the plants also are somewhat glossy and curve to one side and are taller than those of *A. muticum*.

MOLLIA MICROSTOMA.

Var. γ. **elata** (*Schimp.*)

Elongated, densely tufted; caps. minute, subglobose, not reaching the tops of the innovations.

SYN.—*Hymenostomum microstomum* ε. *elatum* BR. SCH. Bry. eur. SCHIMP. Synops. 2 ed. 34.

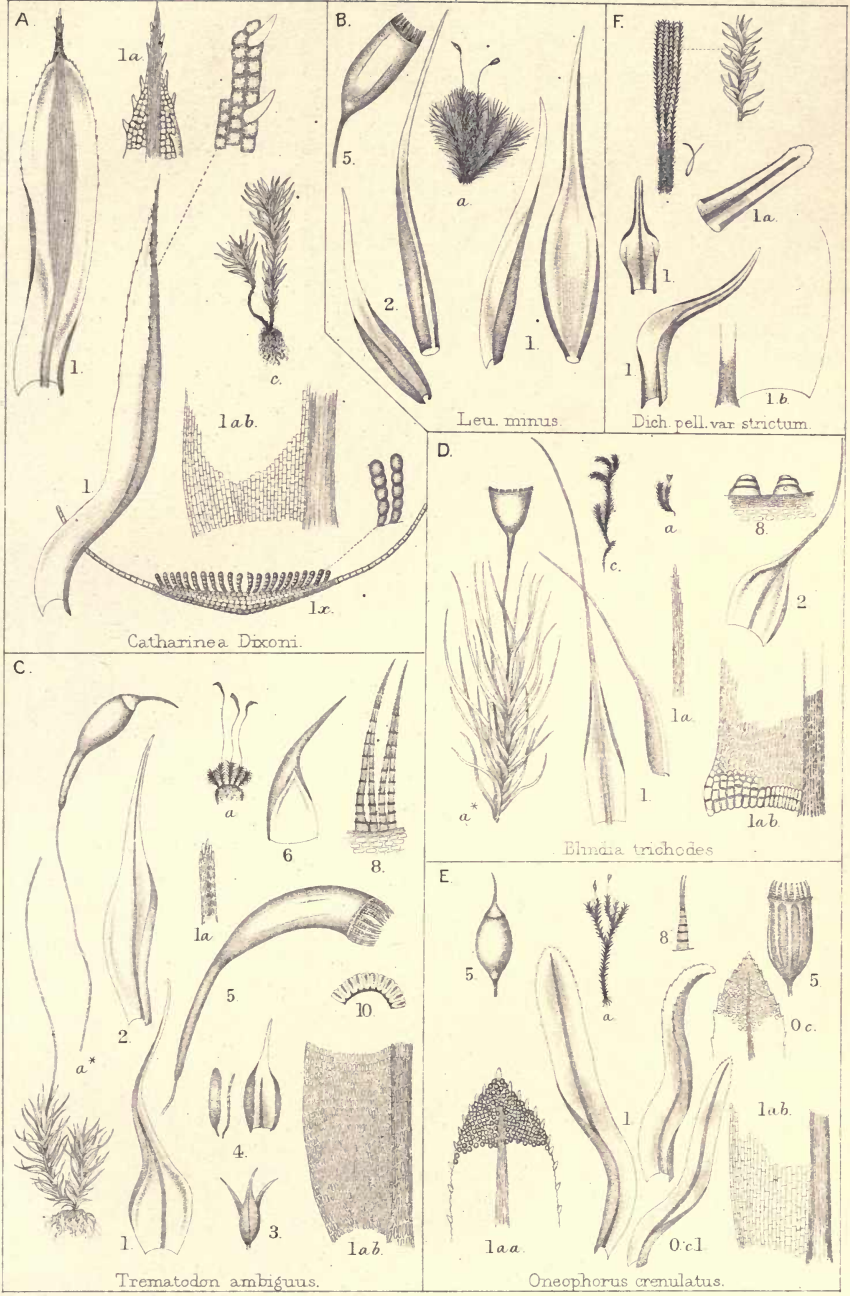
HAB.—Wet rocks. Janets cave, Malham (*Holt* 1885)!! Settle (*Burgess* 1886)!!

Sterile tufts 1½ in. high, apparently referable to this variety, though it is difficult without fruit to distinguish from *M. viridula* var. *densifolia*.

TAB. XLV.

A. *Polytrichum gracile*. B. *Leucobryum minus* (New Forest, *Piffard*). C. *Trematodon ambiguus* (Tummel Bridge, *Braithwaite*). D. *Blindia trichodes* (Bolton, *Scholefield*). E. *Oncophorus crenulatus* (Loch Goil, *Huut*). F. *Dichodontium pellucidum* var. *strictum* (Abergavenny, *Mitten*).

a. Fertile. c. sterile plant. 1. leaf. 1aa. Areolation of apex. 1ab. Do. of base. 2. Perich. bracts. 3. male infl. 4. bract and antheridia. 5. capsule. 6. calyptra. 8. peristome. 10. annulus.


A.
1a
1.
c.
1ab.
1.
1x.
Catharinea Dixoni.
B.
5.
a.
2.
1.
Leu. minus.
F.
γ
1a.
1.
1.
1b.
Dich. pell. var strictum.
D.
a*
c.
a
8.
2
1a.
1.
1ab.
Blindia trichodes
C.
a*
2.
a
6
8.
1a.
5
10.
4.
3.
1.
1ab.
Trematodon ambiguus.
E.
5.
a.
8
5
0c.
1
1ab.
1aa.
0c1
Oneophorus crenulatus.

ADDENDA.

Andreæa Rothii. Isle of Man (*Holt* 1881). Macgillicuddy's reeks (*Stewart* and *Holt* 1885). Var. *hamata.* Injebreck, I. of Man (*Holt* 1881).

——— *crassinervis.* Cromaglown (*Stewart* and *Holt* 1885).

Buxbaumia aphylla. Ogden Clough (*Hanna, Wood* and *Whitehead*). P. 28 and 29. For paroicous read autoicous.

Georgia Brownii. Rocks by R. Aray, Inverary (*Borrer* 1810). Ben Laoigh (*Holt* 1880). Hagg beck, Kilton and Saltburn (*R. Barnes* 1886).

Catharinea crispa. Staley brushes (*Whitehead* 1859).

——— *angustata.* Wickham Bishops, Essex (*Dixon* 1884, st.).

Polytrichum aloides var. *Dicksoni.* Lound and Fritton, Suffolk (*Rev. E. N. Bloomfield*). Delamere, Cheshire (*Holt* 1880).

Polytrichum strictum. Kinder Scout (*Whitehead* and *Holt*). Hutchmere, Cheshire, I. of Man and Cwm Bychan (*Holt*).

——— *commune* var. *fastigiatum.* I. of Man and Delamere (*Holt*). Harleston firs, Northants (*Dixon*).

——— ——— var. *minus.* I. of Man, Delamere and Hale moss (*Holt*).

P. 77, for T. XI, D. read T. XII, A.

Pleuridium alternifolium. Barmouth (*Whitehead*). Hatherley, Cheshire (*Whitehead* and *Scholefield*).

Ditrichum homomallum. Joyden's wood, Kent (*George*). Halstead (*Holmes*). Strome ferry (*Dixon* 1883). Carlingford Mtn. Down (*Holt*).

P. 100, *Weissia zonata* add Nees Hornsch. Bry. germ. ii, P. II, 123, t. 35, f. 33.

Ditrichum subulatum. Bickleigh Vale and Tamerton Ffolliot, Devon (*Holmes*).

Dicranella crispa. Ashley mill (*Holt* 1884).

——— *curvata.* I. of Man (*Boyd* 1886).

——— *heteromalla* β. *stricta.* Anglesey Mtn. Co. Louth (*Rev. C. Waddell* 1883).

——— *secunda.* Trecrobleen hill, W. Cornwall (*Marquand* 1880) ! !

Anisothecium rubrum β. *tenuifolium.* Larne, Antrim (*Stewart* 1876). Ryde (*Cockshott*). Ashley mill (*Holt* 1883). Nassington, Northants (*Dixon* 1885).

——— ——— δ. *callistomum.* Ashley mill and by R. Bollen, Manchester (*Holt* 1884) ! ! Ashwood dale (*Holt*).

——— *crispum* β. *elatum.* Stirrup wood, c. fr. (*Whitehead* 1859). Kersal moor (*Wild* 1879). Bamford wood (*Holt* 1881). Cotterall (*Holt* 1882). Hagg beck and Guisbro' beck, Cleveland (*R. Barnes* 1886).

Seligeria Donii. Ashwood dale, Ravensdale and Monsal dale (*Holt* 1880).

——— *acutifolia* β. *longiseta.* Ravensdale and Taddington dale (*Holt* 1884).

——— *trifaria.* Castleton, Derby (*Rogers* and *Cunliffe* 1881).

——— *paucifolia.* Tunnel wood, Watford (*Holmes* 1883) ! ! Morants Court hill (*Jenner*). Kemsing and Boxley hill, Maidstone (*Holmes*). Between Dartford and Darenth wood (*Holmes*). Undercliff, Folkestone (*Holmes.*)

——— *calcarea.* Taddington dale, Derby (*Holt* 1882).

Brachydontium trichodes. Clogwyn-du-Arrdu (*Holt* 1883). Kilton woods and Saltburn, Cleveland (*R. Barnes* 1886)!!

Didymodon denudatus, c. fr. Tyn-y-groes (*Holt* 1885)!!

Campylopus Schwarzii. Cader Idris (*Holt* 1882). Adara, Donegal (*Holt*).

——— *setifolius.* Monk's dale, Derby c. fr. (*Prof. Barker* 1883). Tyn-y-groes (*Holt* 1885). Benan, Galway (*Holt*). Slieve Snacht west (*Moore*).

——— *introflexus.* Gap of Dunloe (*Stewart* and *Holt* 1885).

——— *atrovirens β. falcatus.* Loch Coruisk, Skye (*Dixon* 1883).

——— *flexuosus β. paludosus.* Boswarva moor, Penzance (*Marquand* 1886).

Dicranum molle. Ben Laoigh, Perth (*Ewing* 1885)!! Ben Challum (*Binstead* 1885).

——— *Bergeri.* Graden moss, Roxburgh (*Boyd* 1872)!!

——— *spurium.* Roborough down, Devon (*Holmes*).

Dicranum fuscescens β. falcifolium. Staley brushes (*Whitehead*).

——— *elongatum.* Summit of Hedgehope, Cheviots (*Hardy*), Ben Attow, Ross (*Dixon*, 1883).

——— *Scottii.* Chiddingstone and Fisher's Castle, Kent (*Holmes*). Mangerton and Torc cascade (*Holt* and *Stewart*, 1885)!!

Dichodontium flavescens. R. Avon below Diptford (*Holmes*). Lydford cascade (*Marquand*). Hagg beck, Kilton and Liverton; Cleveland (*R. Barnes*, 1886).

Oncophorus polycarpus. Dartmoor.

——— *Bruntoni.* Rusthall common and near Tunbridge Wells (*Holmes*). Buckland beacon, Lustleigh and Pew Tor (*Marquand*). Braid woods, Edinburgh (*Lawson*). I. of Man (*Holt*).

Ceratodon conicus. North wall and Howth, Dublin c. fr. (*Lindberg.* 1873)!! Dalwhinnie, Inverness, c. fr. (*Dixon*, 1883)!! Duston and Kingsthorpe, Northants, c. fr. (*Dixon*, 1885)!!

Ephemerum stenophyllum. Limpricht in Rabenh. krypt.—fl. 2 ed. p. 169, points out that this moss must stand as *Eph. sessile*, the *Phascum stenophyllum* of Voit and of the Bryologia germanica really belonging to *Eph. recurvifolium* (DICKS.). BOULAY musc. de l'est 694 (1872).

Phascum Floerkei. Morant's court hill (*Holmes*, 1886)!! Cambridge (*Dixon*).

——— *curvicolle.* Morant's court hill and Westerham (*Jenner*). Greenhithe (*George*). Folkestone (*Holmes*). Gogmagogs, Cambridge (*Dixon*).

Pottia Starkei. Pembury Road, Tunbridge (*Jenner*, 1848). Greenhithe (*George*). Ryde (*Cockshott*, 1885).

——— *cæspitosa.* Between Otford and Kemsing (*Holmes*).

——— *latifolia.* Glen Beg, Perth (*Ewing*, 1886).

——— *crinita.* Southwold, Suffolk (*Dixon*).

Tortula stellata. Boxley hill, Kent (*Holmes.*) Hyde, Cheshire (*Scholefield*). Romiley (*Whitehead*).

——— *ericæfolia.* Greenhithe and Dunton Green, Kent (*Holmes*). Northampton and Kingsthorpe (*Dixon*).

——— *aloides.* Tunbridge. Greenhithe (*George*). Folkestone, Otford and Maidstone (*Holmes*). Saltburn and near Marske mill, Cleveland (*R. Barnes* 1886). Kingsthorpe and Wansford, Northants (*Rogers*).

——— *cuneifolia.* Hopton and Belton common, Suffolk (*Eagle*).

——— *canescens.* Radnorshire (*Rev. J. Fergusson*, April 1882)!! Glen Shee, Clova (*Rev. J. Fergusson*, March 1883)!! Turfy wall-top, Penlee, E. Cornwall (*Rev. A. Ley* 1887).

——— *angustata.* Naseby and Sibbertoft, Northants (*H. V. Dixon* 1880)!!

——— *papillosa.* Hothfield Park, Postling and Lympne, Kent (*Holmes*). Wickham and Witham, Essex (*Dixon*).

——— *ruralis β. arenicola. Barbula ruraliformis* BESCH. BOULAY Musc. de l'est 404. HUSN. Muscol. gall. 115, *t.* 33. North wall, Dublin and Ventry (*Lindberg* 1873)!! Penzance (*Curnow*).

——— *princeps.* Ben Evenagh, Derry (*Stewart* 1885).

Pleurochæte squarrosa. Deal (*Mitten*). Sandwich and New Romney, Kent (*Holmes*). Carbis bay, Cornwall (*Marquand* 1883).

Mollia tortilis. Lindberg points out that *Gymnostomum condensum* of Voit, published the same year as *G. tortile* of Schwaegrichen, must truly have priority, as the latter author cites Voit's name as a synonym. The beautiful figure of Voit is also far better than that of Schwaegrichen.

——— *tenuis.* Duston, Northants (*Dixon*). Kilton, Liverton and Hagg beck (*R. Barnes* 1886).

——— *viridula* δ. *densifolia.* Tyn-y-groes (*Holt* 1885).

——— *crispula* δ. *nigro-viridis.* Monk's dale (*Holt* 1886).

——— *litoralis.* Hagg beck wood, Kilton and Easington, Cleveland (*R. Barnes* 1887).

——— *tenuirostris.* Kintail, Ross, c. fr. (*Dixon* 1883).

——— *flavo-virens.* Dover cliff (*Howse*). Deal and Romney marsh (*Holmes*).

——— *inclinata.* Newlyn cliff and Lamarna (*Curnow* 1872). Staddon heights (*Holmes* 1867). Peel, I. of Man (*Holt* 1884).

Barbula brevifolia. Lane near Rusthall common and Romney marsh (*Holmes*). Rochester (*Howse*). Bullingdon bog, Witney (*Boswell*). Northampton (*Dixon*).

——— *fallax* γ. *brevifolia.* Kemsing and Wye, Kent (*Holmes*). Duston, Northants (*Dixon*). Pepperstock, Beds. (*Saunders*).

——— *cylindrica.* Great Glemham, Suffolk (*Eagle*). Tring and Greenhithe (*Holmes*). Lydford (*Marquand*).

——— *sinuosa.* Sevenoaks, Brastead, Otford and Hythe (*Holmes*). Bush mills, Naseby Croughton and Houghton, Northampton (*Dixon*).

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CLASSIFIED LIST OF SPECIES.

MUSCI ACROCARPI.

I. SCHISTOCARPI.

Fam. 1. ANDREÆACEÆ.

ANDREÆA *Ehrh*

§ 1. *Euandreæa.*

1. **A. petrophila** *Ehrh.*
   - β. **homomalla** *Schp.*
   - γ. **acuminata** ——
   - δ. **flaccida** ——
   - ε. **sylvicola** ——
   - ς. **gracilis** ——
   - η. **alpestris** *Theden.*
   - ϑ. **sparsifolia** (*Zetterst.*)
2. **A. alpina** (*Dill.*) *Sm.*
   - β. **compacta** *Hook.*
   - γ. **flavicans** ——
3. **A. crassinervis** *Bruch.*
   - β. **Huntii** (*Limpr.*)
4. **A. Rothii** *W. M.*
   - β. **frigida** (*Hueb.*)
   - γ. **hamata** *Lindb.*
   - δ. **falcata** (*Schimp.*)

§ 2. *Chasmocalyx.*

5. **A. nivalis** *Hook.*
   - β. **fuscescens** *Hook.*

II. STEGOCARPI.

A. Anarthrodontei.

Fam. 2. BUXBAUMIACEÆ.

BUXBAUMIA *Hall.*

1. **B. aphylla** *L.*
2. **B. indusiata** *Brid.*

Fam. 3. GEORGIACEÆ.

GEORGIA *Ehrh.*

1. **G. pellucida** (*L.*) *Rabenh.*
2. **G. Brownii** (*Dicks.*) *C. M.*

Fam. 4. POLYTRICHACEÆ.

CATHARINEA *Ehrh.*

1. **C. angustata** *Brid.*
2. **C. undulata** (*L.*) *Web. Mohr.*
   - β. **minor** (*Hedw.*)
3. **C. crispa** (*James*).
   - β. **densifolia** *Lindb.*

OLIGOTRICHUM *Lamk. D. C.*

1. —— **incurvum**(*Huds.*) *Lindb.*
   - β. **laxum** *Braithw.*

POLYTRICHUM *Dill.*

§ 1. *Aloidella.*

1. **P. subrotundum** *Huds.*
   - β. **longisetum** (*Hampe*).
2. **P. aloides** *Hedw.*
   - β. **Dicksoni** (*Turn.*)

§ 2. *Pogonatum.*

3. **P. urnigerum** *L.*
   - β. **humile** *Wahlenb.*
4. **P. alpinum** *L.*

§ 3. *Eupolytrichum.*

5. **P. sexangulare** *Floerke.*
6. **P. gracile** *Dicks.*
7. **P. attenuatum** *Menz.*
8. **P. piliferum** *Schreb.*
9. **P. juniperinum** *Willd.*
10. **P. strictum** *Banks.*
11. **P. commune** *L.*
    - β. **perigoniale** (*Michx.*)
    - γ. **minus** *Weiss.*
    - δ. **fastigiatum** (*Lyle*).

B. ARTHRODONTEI.

† *Gamophylleæ.*

Fam. 5. FISSIDENTACEÆ.

FISSIDENS *Hedw.*

1. **F. exilis** *Hedw.*
2. **F. exiguus** *Sull.*
3. **F. minutulus** *Sull.*

4. F. viridulus (*Swartz*) *Wahl.*
5. F. incurvus *Starke.*
   β. tamarindifolius. (*Don*).
6. F. Tequendamensis *Mitt.*
7. F. bryoides (*L.*) *Hedw.*
   β. intermedius *Ruthe.*
8. F. Curnowii *Mitt.*
9. F. fontanus *Schimp.*
10. F. rivularis *Spruce.*
11. F. rufulus *Br. Sch.*
12. F. osmundoides (*Swartz*) *Hedw.*
13. F. serrulatus *Brid.*
14. F. taxifolius (*L.*) *Hedw.*
15. F. cristatus *Wils.*
    β. brevifolius *Lindb.*
16. F. adiantoides (*L.*) *Hedw.*
    β. collinus *Mitt.*
17. F. polyphyllus *Wils.*

†† *Eleutherophylleæ.*

Fam. 6. LEUCOBRYACEÆ.

LEUCOBRYUM *Hampe.*

1. L. glaucum (*L.*) *Schimp.*
2. L. minus *Hampe.*

Fam. 7. DICRANACEÆ.

§ 1. *Ditricheæ.*

ARCHIDIUM *Brid.*

1. A. alternifolium (*Dicks.*) *Sch.*

PLEURIDIUM *Brid.*

1. P. axillare (*Dicks.*) *Lindb.*
   β. strictum (*Dicks.*)
2. P. subulatum (*L.*) *Rabenh.*
3. P. alternifolium (*Kaulf.*) *Rabenh.*

DITRICHUM *Timm.*

§ 1. *Trichodon.*

1. D. tenuifolium (*Schrad.*) *Lindb.*

§ 2. *Euditrichum.*

2. D. tortile (*Schrad.*) *Hampe.*
   β. pusillum (*Hedw.*)
3. D. homomallum (*Hedw.*) *Hampe.*
   β. zonatum (*Funck*).
4. D. subulatum (*Bruch.*) *Hampe.*
5. D. flexicaule (*Schleich.*) *Hampe.*
   β. densum (*Br. Sch.*)

SWARTZIA *Ehrh.*

1. S. montana (*Lamk.*) *Lindb.*
   β. compacta (*Hueben.*)
2. S. inclinata *Ehrh.*

§ 2. *Trematodonteæ.*

TREMATODON *Michx.*

1. T. ambiguus (*Hedw.*) *Hornsch.*

§ 3. *Dicranelleæ.*

DICRANELLA *Schimp.*

1. D. crispa (*Ehrh.*) *Sch.*
2. D. secunda (*Swartz*) *Lindb.*
3. D. curvata (*Hedw.*) *Sch.*
4. D. heteromalla (*Dill.*) *Sch.*
   β. stricta *Sch.*
   γ. interrupta (*Hedw.*)
   δ. sericea *Sch.*
5. D. cerviculata (*Hedw.*) *Sch.*
   β. pusilla (*Hedw.*)

ANISOTHECIUM *Mitt.*

1. A. rubrum (*Huds.*) *Lindb.*
   β. tenuifolium (*Bruch*).
   γ. tenellum (*Sch.*)
   δ. callistomum (*Dicks.*)
2. A. rufescens (*Dicks.*) *Lindb.*
3. A. Grevillei (*Br. Sch.*) *Lindb.*
4. A. crispum (*Schreb.*) *Lindb.*
   β. elatum (*Sch.*)
5. A. squarrosum (*Starke*) *Lindb.*

§ 4. *Seligerieæ.*

SELIGERIA *Br. Sch.*

1. S. Donii (*Sm.*) *C. M.*
2. S. pusilla (*Ehrh.*) *Br. Sch.*
3. S. acutifolia *Lindb.*
   β. longiseta *Lindb.*
4. S. trifaria (*Brid.*) *Lindb.*
5. S. paucifolia (*Dicks.*) *Carruth.*
6. S. calcarea (*Dicks.*) *Br. Sch.*
7. S. setacea (*Wulf.*) *Lindb.*

BRACHYDONTIUM *Bruch.*

1. B. trichodes (*Web. Mohr*) *Fuern.*

§ 5. *Dicraneæ.*

BLINDIA *B.* and *S.*

1. B. cæspiticia (*Schwæg.*) *Lindb.*
2. B. trichodes (*Wils.*) *Lindb.*
3. B. acuta (*Huds.*) *Br. Sch.*

DIDYMODON (*Hedw.*) *W. M.*

1. D. denudatus (*Brid.*) *Lindb.*
   β. alpinus (*Sch.*)

CAMPYLOPUS *Brid.*

1. C. pyriformis (*Schultz*) *Brid.*
2. C. fragilis (*Dicks.*) *Br. Sch.*
3. C. Schimperi *Milde.*

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